ADDE SALEM

A DOUBLE **D**EGREE IN **E**UROPE
SOUTH **A**MERICAN **L**EADERSHIP AND **EM**PLOYABILITY

Edited by Giancarlo Spinelli, Politecnico di Milano
Milano, Italy

adde salem
Leadership & Employability

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ERASMUS MUNDUS

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Contributors

During the three years of the activities of the Adde Salem many colleagues have worked intensively to the project serving in its different committees, and participating in the meetings, in the open conferences and in the seminars.
Here they are mentioned in the Committee where they put their main efforts.
However, the majority of them also contributed to the other activities of the project.

WORKING COMMITTEES

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Fouad Bennis – ECN (Chair 2nd phase)
Barbara Del Sole – POLIMI
Marcelo Meregalli Ferrer- AUSTRAL

Only the names of the authors of the final text appear under the title of each chapter. However the work is the fruit of the collective effort of all the members of the relevant Committees.

1.

The ADDE SALEM Project

ADDE SALEM is an ERASMUS MUNDUS Action 3 project.

The Partner Institutions of the consortium are:

- **Politecnico di Milano,** Milano, Italy (Coordinator)
- **École Centrale de Lille,** Lille, France
- **École Centrale de Nantes**, Nantes, France
- **École Centrale Paris** , Paris, France
- **Budapest University of Technology and Economics,** Budapest, Hungary
- **Instituto Superior Técnico de Lisboa,** Lisboa, Portugal
- **Universidad Politécnica de Madrid**, Madrid, Spain
- **Lund University**, Lund, Sweden
- **Instituto Tecnológico de Buenos Aires,** Buenos Aires, Argentina
- **Universidad Austral** , Buenos Aires, Argentina
- **Universidade Federal do Rio de Janeiro,** Rio de Janeiro, Brasil
- **Universidade de São Paulo,** Sao Paulo, Brasil
- **Universidad Técnica Federico Santa María**, Valparaiso, Chile
- **Pontificia Universidad Catolica de Chile,** Santiago de Chile, Chile
- **Universidad del Norte**, Barranquilla, Colombia
- **Pontificia Universidad Javeriana** , Bogotà, Colombia

They have also involved Associate Partners

- CAPMAC, Milano, Italy
- Regione Lombardia, Italy
- Rotary Club Milano Sempione; Italy
- SOREN, Milano, Italy
- FAGOR Hungaria, Hungary
- Hungarian Chamber of Engineers, Hungary
- Parque Austral, Argentina
- The Italian Chamber of Commerce, Buenos Aires, Argentina
- John Deere Argentina
- NEORIS, Argentina
- SESA International, Argentina
- Taurus de Argentina
- Berkley international Seguros, Argentina
- Flexocolor, Argentina
- Michelin Brazil
- Ingenieria DICTUC, Chile
- Ministry of Education of Colombia

The objective of the project is to promote ERASMUS MUNDUS Joint (and Double) Degrees in South America. We focus on Engineering and all the possibly connected disciplines. We are convinced that this can be efficiently and permanently done only with a strict collaboration with South American Institutions.
If we consider South America and in particular its most developed economies (Argentina, Brazil, Chile and Colombia) it is evident that the major obstacle to sending their best students to Europe for higher education can be the fear of brain drain, since those are the countries that already need young people trained to become top level engineers for the productive and economical world.
To succeed in attracting the best students and young researchers we have to share, with our South American partners, ambitious objectives that could give an answer to the questions: Why? What? How?
Why? The final purpose must be greatly enhancing the employability in South America. This means that the curricula offered at European Institutions in cooperation with South American ones, must respond

to the needs of the South American job market, which implies a systematic study of such needs.

What? The instruments we analyse are the Joint Degrees within the ERASMUS MUNDUS framework. In this chapter (project description) we will adopt the terminology of the ERASMUS MUNDUS guide, i.e. by Joint Degree Courses we will mean courses that "lead to the award of recognized joint, double, or multiple degrees to successful students". In Chapter 3 (Simple guidelines for double and joint degrees) we will analyse these courses more in detail and we will propose a specific terminology.

We decided to consider only graduate curricula, both at Master and at Doctoral level since, at this level, the basic courses have already been given and we can focus also on specificities. Some issues are common to both and some are very specific. That is why we began our activities concentrating on Joint Masters programmes. Only in a second phase we considered the problems of Joint PhDs.

How? We put in place a virtuous loop whereby the feedback from various constituencies on the existing programmes is compared with the emerging needs of the job market in order to create a benchmark that will continuously influence and innovate the educational projects under preparation.

The project ADDE SALEM involves partner Institutions that have a long record of successful cooperation on both sides of the Atlantic. Double degrees between the European partners and the South American ones have been signed and implemented for many years. This guarantees the availability of an already consistent pool of South American double graduates. They and their employers will be the most valuable resource for the ADDE SALEM study. Moreover, all the Institutions have very strong links with the industrial world . The South American Institutions invited local Industries interested to internationalise their technical and managerial staff while, the European Institutions mainly invited European companies that operate or intend to operate in South America by recruiting local engineers. In this way the non academic partners are the best source of information related to employability in South America.

In other words, the needs were and are: for the European partners to set up a virtuous loop in order to innovate and keep some of their joint curricula in focus with the real needs of the South American job market, for the South American partners to see and be involved in a systematic study that shows how sending their best students to European Institutions for joint degrees will enhance their employability at home.
The South American Institutions come from Argentina, Brazil, Chile, and Colombia i.e. those countries with a job market ready to absorb engineers with a high qualification that includes the international awareness. The European partners represent a sample of Institutions from the south, the north, the center and the east of the continent.

The critical moment for the attractiveness of a joint degree between Europe and South America comes when a student that is considering passing at least a period of studies abroad, has to answer the question: Why?
All of us at the Universities think to have answers but, most of the times, they are based on analyses done in a self-referential framework (typically Conferences among academics). Moreover, when referring to the external world, like employers and alumni, we base our point of view mainly on anecdotic experiences.
The final goal of the project ADDE SALEM has been to run a systematic study and to provide objective, reliable and elaborated data to allow the following honest answer: *You have to pass a period of studies at an Institution of the other continent because that will greatly enhance your employability at home. A joint degree will give you the skills and competencies demanded of a future leader in the productive and economical development of your country.*
This is the goal. To reach it we need, first of all to study the **needs** of the job market in the four countries we are addressing in South America. This study must be systematic and done hand in hand with the Industrial world of those countries. That is why all the participating Institutions have been chosen for their

long experience of very strict links with the industrial and economic sector in their countries and abroad. Questionnaires and Focus Groups have been the main tools for gathering data.
The Open Conferences in South America have been the forums of discussions and the moments of resetting the tools of the iterative procedures.
The second ring of the chain is to **innovate** joint curricula in order to respond to such needs. We think that innovation can be really instrumental to enhance the attractiveness of joint degrees, only if done in strict cooperation with our South American partners.
We also decided to start the dissemination of the results at an early stage. That is why the four **Consortium meetings** in South America (one for each country and each lasting two days) have been preceded by a one day **Open Conference** were we welcomed suggestions and criticisms from Institutions, Industries and Associations not pertaining to the initial core group of the consortium.

1.1 Aims and objectives of the project

The overall aim is creating a win-win situation between South American and European partners leading to consider as a common goal having students involved in Joint Degree projects. A strong commitment of various actors (Institutions, Companies, Associations, Governmental bodies) is necessary to make such flows sustainable even after the period financed by each ERASMUS MUNDUS (Action 1A and 1B) or ERAMUS + projects.
To arrive to that situation we shared the following specific objectives:

- A detailed study of the different schemes utilized by highly integrated international programmes between South America and Europe.
- A benchmark of the existing Joint degrees towards the needs of the South American advanced job market.
- A systematic gathering of data from different constituencies relevant to the project.

- Innovation of some curricula of Joint Degrees. Those degrees will be particularly designed for the needs of South American students and will be very attractive for them.
- A dissemination inside the South American Institutions to create the atmosphere of cooperation towards the Joint degrees' recruitment.
- An external dissemination towards the perspective candidates in South America.
- An external dissemination toward companies, associations and governmental bodies to make them aware of the value added of employing joint graduates in South American countries.
- An external dissemination towards other European and South American Institutions to encourage them to set up joint degree projects that take into account the results of our study.

What is new is the systematic approach to the problem. At present, in the Academic world, as previously mentioned, we already speak of the skills and competencies of engineers that are needed by the job market of those countries, at international conferences and workshops, but very often this knowledge is based on anecdotic experiences. Here, the involvement of all the actors and the procedures devised for this study will allow a systematic data gathering and thorough analysis, at the same time avoiding the risk of self-reference bias.

1.2 Activities of the project.

The five main kinds of activities are: Web-based Surveys, Focus Groups, Open Conferences, Working Groups and Seminars. They have been organized so as to set up a "virtuous loop".

We consider as our constituencies (stakeholders) the following ones:

a. *South American students already involved in Joint degrees in or with Europe.*
b. *South American professors tutoring their students in international programmes.*

c. *South American alumni that already have been awarded joint degrees in or with Europe.*
d. *Employers in South America.*

Web-based surveys have been designed with the help of a sociologist and are aimed at knowing *what*. In Chapter 4 the methodology is explained. The results of the analysis are given in Chapters 5, 6 and 7.
Focus groups were organized at each Institution for different constituencies in small groups of 5 to 7 people. They aimed at better understanding the reasons of the outcomes of the questionnaires.
Open conferences were held at the South American Institutions back to back with the Consortium meetings. In this way all the participants were involved. Not only have they been open to local Companies and Associations, but also to other Institutions not member of the consortium but interested in the study. In this way, on the one hand we had inputs from a wider open discussion, and on the other hand we began the dissemination process.
The Open Conferences have been the events where the Institutional partners of the consortium met all the constituencies of the country of the Conference. In particular at each Open Conference there have been invited speakers representative of the industrial world of that country. The Open Conferences were given publicity on the media.
Working groups have been set up at each of the European Institutions to analyse the curricula of the existing joint degree programmes and to suggest innovations according to the gathered results. Each WG had one member from each South American country. The South American partners interacted via e-mail and videoconferencing with their WG.
Seminars were organized at each European Institution by the relevant working groups, one for joint Masters and one for Joint Doctorates. Each seminar was also attended by one representative from each of the South American Countries.
Their purpose was to discuss the outcomes of the project with the decision makers of the European Institutions.

The time sequence of the activities has been planned to set up a virtuous loop. Implementing it in an iterative way will allow to continuously improve the quality of the joint and double degree programmes.

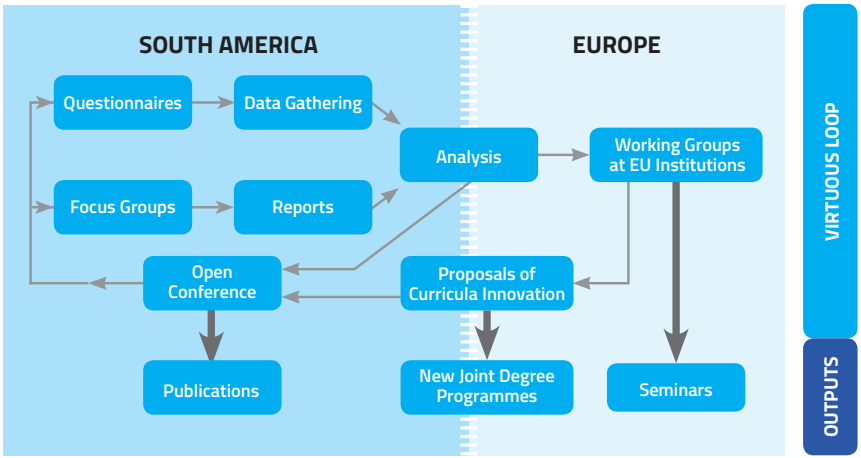


Fig. 1.1 The virtuous loop

In order to manage the process, the following Committees were set up:

- **Management Committee.**
- **Organizing Committee on Survey and Focus Groups.**
- **Committee on WGJs (Working Groups on Joint Masters, and Working Groups on Joint Doctorates).**
- **Communication Committee.**
- **Alumni Committee.**
- **Employers Committee.**
- **Quality and Evaluation Committee.**
- **Glossary Committee.**

The participants to these Committees are listed as contributors at page 5.

2.

The Architecture of the Curricula for Double and Joint Degrees in Engineering between Europe and South America

Giancarlo Spinelli
Politecnico di Milano, Milano, Italy

Joint and Double Degrees are very common in intra-European student mobility, but they are also spreading (even if at a lesser extent) in intercontinental exchanges. Two issues emerge as the main sources of misunderstanding. On the one hand some confusion of terms still exists. On the other hand these programmes are offered with a great variety of architectures of the relevant curricula. The problem of the glossary will be afforded in Chapter 3, while here a preliminary tentative catalogue is given of the most diffused schemes. The perspective is that of engineering graduate programmes both at the level of masters and doctorates, and particular attention is given to those degrees involving at least an European and a South American Higher Education Institution (HEI). One of the purposes is to suggest those schemes to HEIs that have not yet implemented them, at the same time providing an instrument for a better mutual understanding when negotiating new joint and double degrees.

Joint and double degree programmes are generally considered as the top products implemented by HEIs for international exchanges. Moreover they are almost always offered to the best students of each Institution and are very demanding in terms of commitment of the students. That is why a clear view on the motivations of the candidates and on the feedback of the job markets is extremely important.
When dealing with these programmes one soon recognizes the need of clarifying terms (relevant to Double and Joint Degrees) that sometimes are used with different meanings in various parts of the world and also at different Institutions of the same country (see Chap.3), and to start preparing a catalogue of the very many schemes in use.
Many diagrams and relevant explanations have already been published by the author in the chapter "La Arquitectura de los Planes de Estudios Para la Titulaciones Dobles Y Conjuntas en Ingenieria: Hacia un Catalogo" of the book titled "America Latina: Retos y Compromisos para la Internacionalizacion de la Educacion Superior", Edited by Luis David Prieto M. and Carmen Helena de Pena with the support of Pontificia Universidad Javeriana.

There is an enormous number of possible schemes. That is why the present Chapter is far from proposing a complete catalogue of such schemes. Having in mind the HEIs partners of the ADDE SALEM Consortium and their specificities, schemes are presented that have already been implemented or studied by them among the consortium or with third partners.
The graphic instrument should help to better understand their structure. Moreover other schemes, that are not shown here but can be proposed in the future, could be easily described in terms of the differences with some of the presented ones.

2.1 Higher Education Systems

The most important data to be taken into account come from the Higher Education Systems that are different in different countries. Even in Europe, the Bologna process has reduced but not eliminated those differences.
Here we only give the systems of the countries of the ADDE SALEM member institutions.

The coloured boxes correspond to years of education. Where ECTS is not mentioned, the workload is calculated with local units. Let us also recall that 60 ECTS credits correspond to the workload of one year.

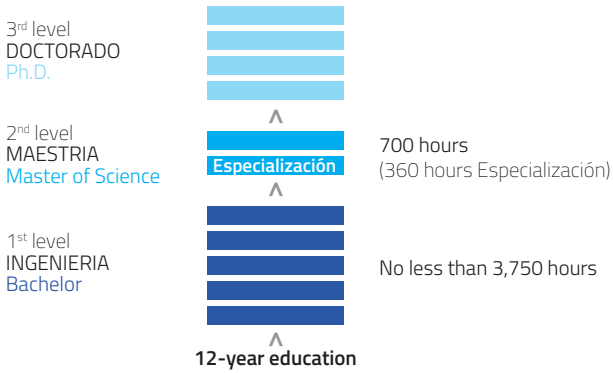


Fig. 2.1 - Argentinian higher education system

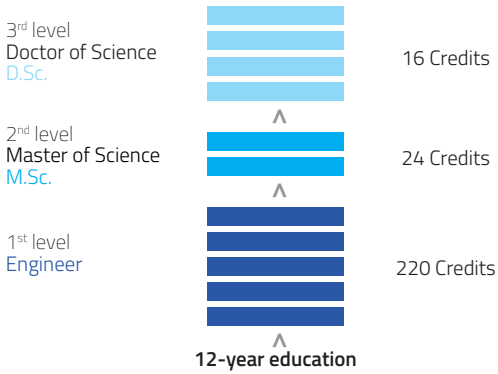


Fig. 2.2 - Brazilian higher education system
(Credits are given in local units and refer to coursework only, not to research workload)

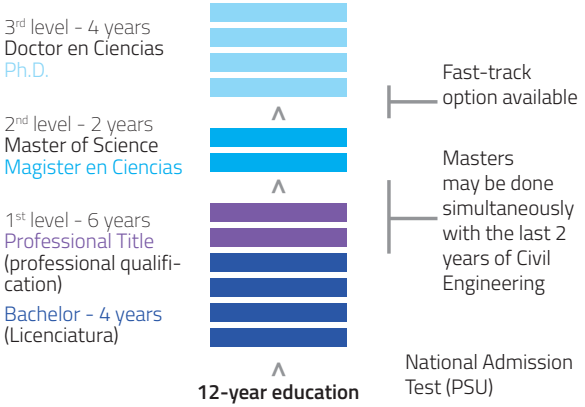


Fig. 2.3 - Chilean higher education system ("Civil" Engineering stands here for "non military")

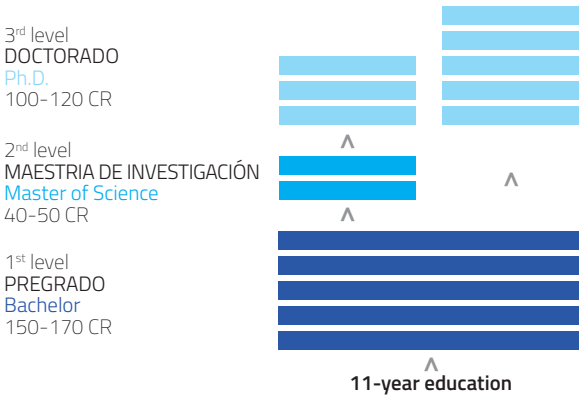


Fig. 2.4 - Colombian higher education system

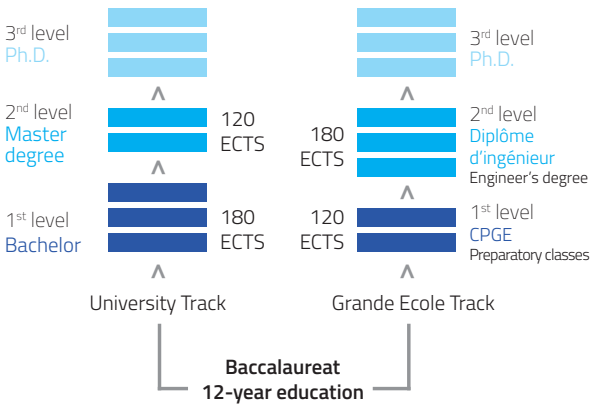


Fig. 2.5 - French higher education system
(For the Grandes Écoles, the most common system, adopted in particular by the Écoles Centrales is given)

Fig. 2.6 - Hungarian higher education system

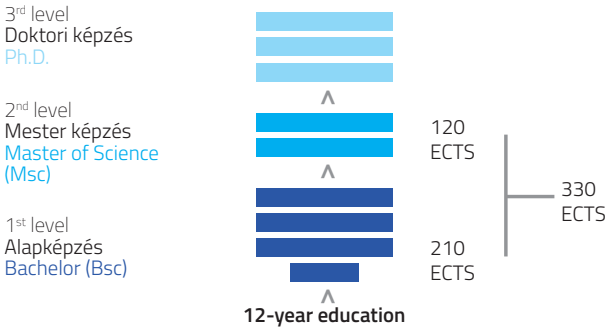


Fig. 2. 7 - Italian higher education system

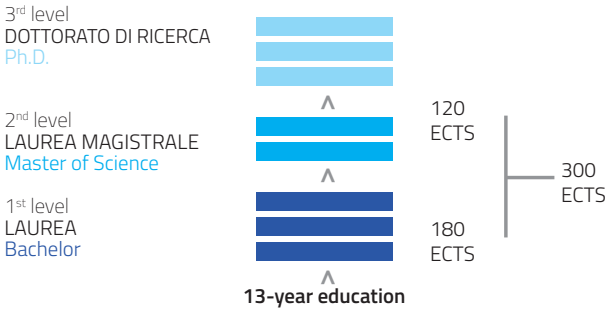
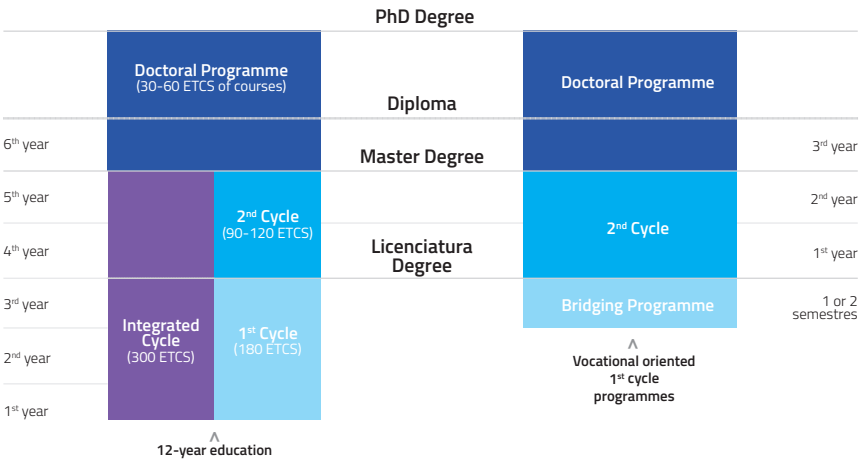


Fig. 2. 8 - Portuguese higher education system



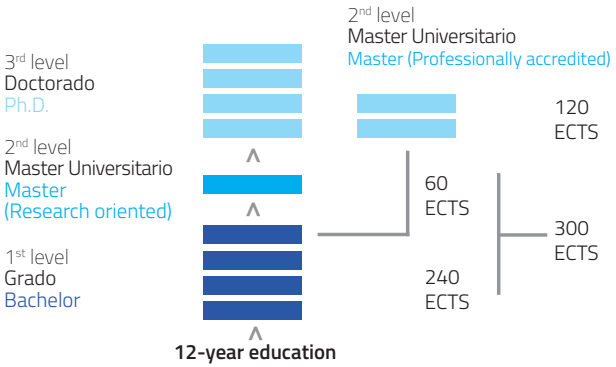
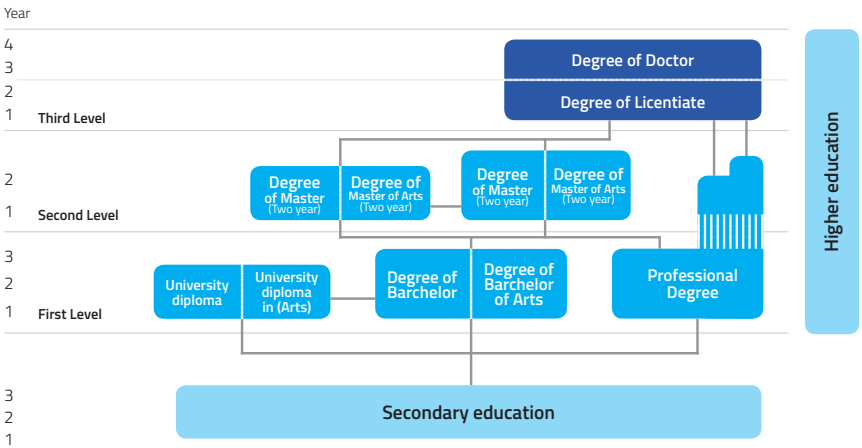


Fig. 2. 9 - Spanish higher education system

Fig. 2. 10 - Swedish higher education system



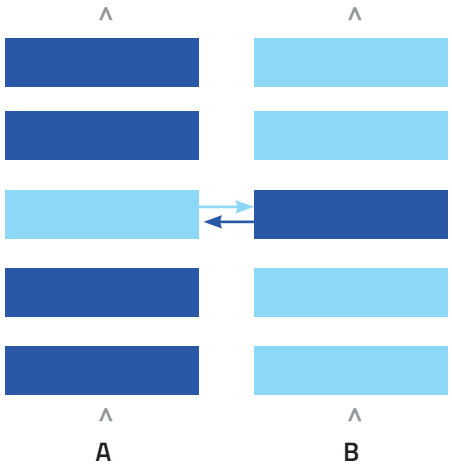
As one can see, the systems are still far from being homogeneous.
In ADDE SALEM we share the opinion that this is one of the reasons why a double degree is particularly interesting; we want our students to take more advantage of the differences than of the similarities.

2. 2. Horizontal and Vertical Mobility

Many of the following diagrams and relevant explanations have already been published by the author in the chapter "La Arquitectura de los Planes de Estudios Para la Titulaciones Dobles Y Conjuntas en Ingenieria: Hacia un Catalogo." of the book titled "America Latina: Retos y Compromisos para la Internacionalizacion de la Educacion Superior", Edited by Luis David Prieto M. and Carmen Helena de Pena with the support of Pontificia Universidad Javeriana.

When speaking of student mobility one has to distinguish between Horizontal and Vertical.
Horizontal Mobility. Students are substituting one block at the Host Institution for an equivalent part of their curriculum at the Home Institution.

Fig. 2. 11 - Horizontal mobility



This kind of mobility has been particularly important in Europe where it has been promoted by the ERASMUS Programme (for a time under SOCRATES programme, than under Life Long Learning Programme and now ERASMUS +).
The duration of the period abroad can be very different. In the Erasmus mobility, it can go from 3 to 12 months. This kind of mobility has been implemented

at the undergraduate and at the graduate level.
A different kind of mobility, very popular in North America, is the so called *Vertical Mobility* whereby a student after having been awarded the Bachelor Degree usually moves to another Institution for his/her graduate studies and sometimes changes again after the Master if he/she continues in a Ph.D. programme.

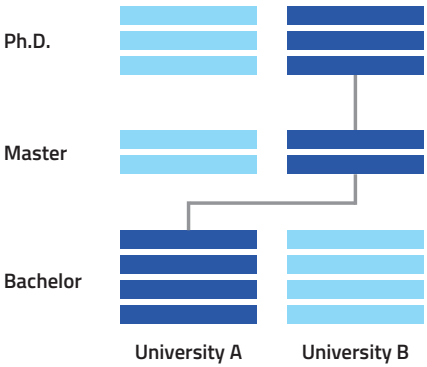


Fig. 2. 12 - Vertical Mobility

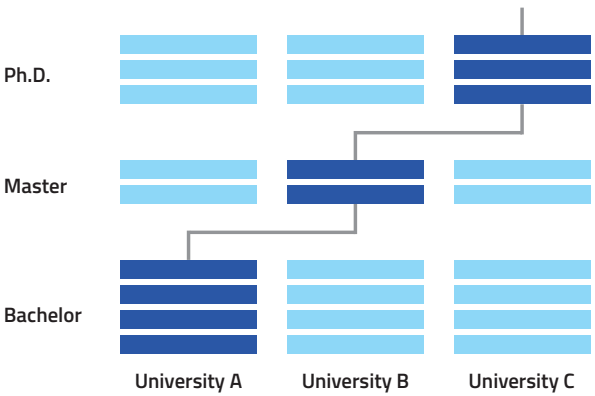


Fig. 2. 13 - Vertical Mobility

The Bologna process, is making vertical mobility easier also in Europe. After many years since the start of the Bologna Process the cultural attitude of students and families is changing and this kind of mobility is taking off.
Inside South America, only very limited exchanges between countries have been developed (both vertical and/or horizontal). On the other hand significant numbers of students are exchanged with countries of other continents like Europe, North America and Asia.

2.3 Highly Integrated Programmes

We speak of highly Integrated Programmes when the Host Institution not only is a provider of some courses, but also is awarding its final title together with the Home Institution or independently of it. Many different names are used for those titles as will be discussed in Chap. 3.
Let us anticipate two definitions that can allow us to avoid misunderstandings.

Fig. 2. 14 - Definitions

We speak of Double (or Dual) Degree programme when each of the two Institutions involved awards its own, full fledged, degree to the student who fulfilled the prescribed requirements.

A Joint Degree is a single document jointly issued by the two (or more) Institutions involved in the programme.

The ADDE SALEM project provides a feedback from various constituencies on this kind of programmes for Engineering. The Consortium consists of 8 European and 8 South American Institutions. That is why the main focus is on transatlantic exchanges. However some reference is also given to exchanges within the same continent.

Here following, a partial catalogue of the schemes implemented or studied is given. Many other schemes exist. Those here presented are the most popular ones among the partners of the ADDE SALEM consortium. Different schemes can easily be described using the same graphical language, making evident the differences and the similarities.

2.4 Double Degrees at the Master level

The Double Degree programmes have been created in the late 80's. In Engineering the T.I.M.E. (Top Industrial Managers for Europe) Association stands as the most relevant example of good practice. In 1988 Double Degrees in Engineering at the Graduate level were conceived at École Centrale Paris and started in a small group of Institutions. Students have to substitute one year at the Home Institution with two years at the Host Institution. T.I.M.E. became an Association in 1997 and nowadays counts 52 Member Institutions. Around 5000 students already got the two degrees following that scheme and are performing brilliant careers in Europe and outside Europe. The first South American Institution to join T.I.M.E. was Universidad de Sao Paulo, Escuela Politécnica. Another South American Institution is joining.
The vision of such kind of double degrees has been followed by some partners of the T.I.M.E. Association even when establishing double degrees with Institutions that are not partners of T.I.M.E., in particular with South American partners. That is why in the ADDE SALEM study we used that model of double degree as a guideline.
The schemes shown in Figs. 2.15 to 2.20 have been implemented and are widely used by couples of European Institutions.
In these figures the term "Master of Science" stands for the title awarded at the end of the second cycle. It has different names in different countries and it is generally considered equivalent to a Master of Science.
The schemes reported are not all the existing ones (not even between European partner Institutions of

the ADDE SALEM consortium) but are the ones that provide a logical framework, for the Institutions already involved, to implement schemes with the South American partner Institutions according to a coherent policy.

Fig. 2. 15 - A Double Degree scheme where both the Home and the Host Institutions adopted the so called 3+2 educational system.

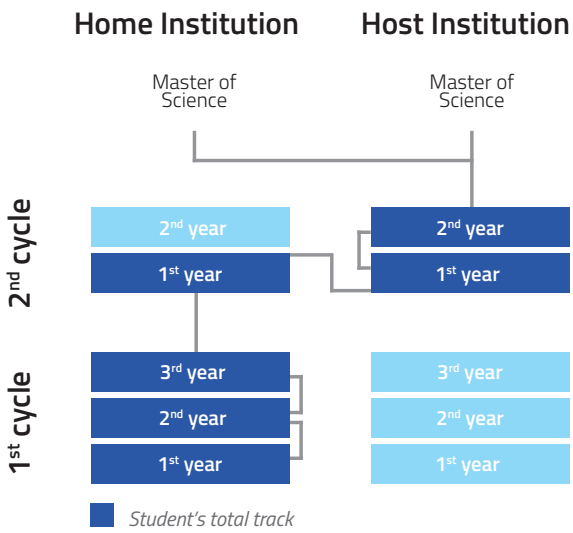
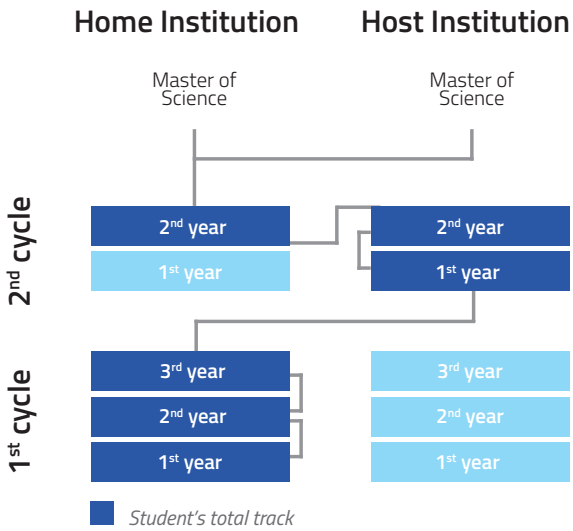


Fig. 2. 16 - A Double Degree scheme where both the Home and the Host Institutions adopted the so called 3+2 educational system.



France and Spain are two cases apart.
As to France, two different higher education systems co-exist (see Fig.2.5) The Universities have adopted the so called 3 + 2 system (and therefore the Double Degree schemes with them are the same ones shown in Figures 2.15 and 2.16). On the other hand, students that want to enter the Grandes Écoles, after high school and after passing their school leaving exam (Baccalaureat), have to attend the Classes Preparatoires and then participate in a very selective entrance exam. The Grandes Écoles, with very few exceptions, are providing a three-year course leading to a title (Diplome d'Ingenieur) equivalent to a Master of Science. The students of European Institutions that have already adopted the so called 3 + 2 system, and that are selected for a Double Degree with a Grande École have to follow (depending on which Institution) either the scheme of Fig. 2.17 or the one of Fig. 2.18.

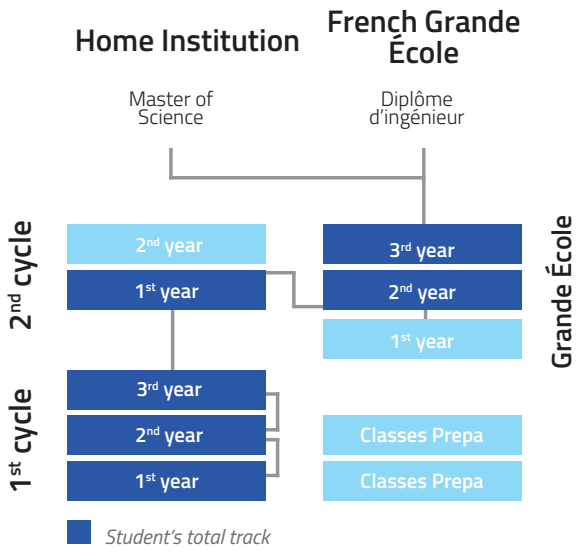
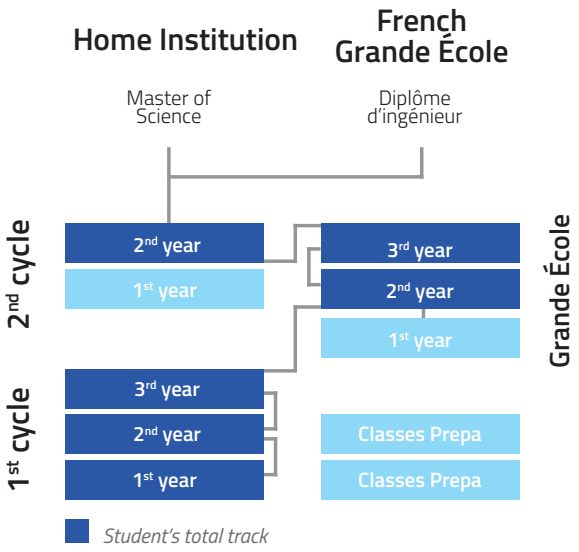


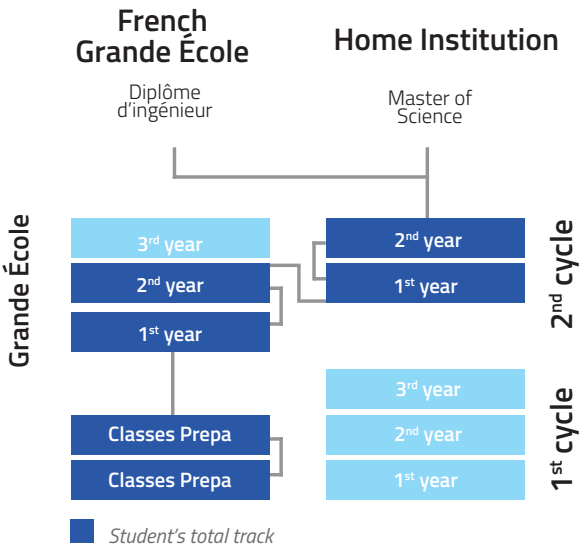
Fig. 2. 17 - A Double Degree scheme where the Home Institution adopted the so called 3+2 educational system while the Host Institution is a French Grande École.

Fig. 2.18 - A Double Degree scheme where the Home Institution adopted the so called 3+2 educational system while the Host Institution is a French Grande École.



For the mobility in the opposite direction the scheme 2.19 is adopted.

Fig. 2.19 - A Double Degree scheme where the Home Institution is a French Grande École while the Host Institution adopted the so called 3+2 educational system.



An important exception is given by the Double Degree with the five Écoles Centrale. In that case the scheme is that of Fig. 2.20. The reason to move students at such an earlier stage is the particular emphasis given by the Écoles Centrale to their first two years (Tronc Commun) where the "generalist" imprinting is assured. A further advantage of this scheme is that Double Degree students enter the first year of the École together with the local students, which fosters a stronger cultural integration.

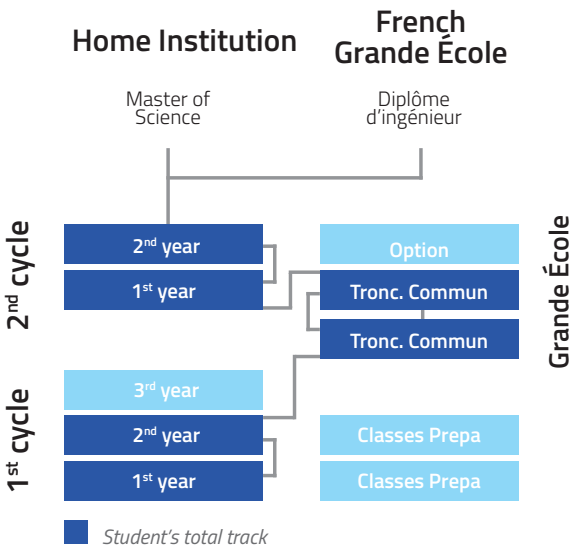


Fig. 2.20 - A Double Degree scheme where the Home Institution adopted the so called 3+2 educational system while the Host Institution is one of the five Écoles Centrale.

As to the students whose Home Institution is an École Centrale, they too follow the scheme of Fig. 2.19.

Coming to the European exchanges with Spanish Institution, the system of Fig. 2.9 has to be taken into account. The adoption of that educational system is quite new and many double degree agreements are still under renegotiation. The schemes that seem to emerge (and already implemented by the Politecnico di Milano) are the following ones.

Fig. 2.21 - A Double Degree scheme where the Home Institution is Spanish and the Host Institution (in the specific example the Politecnico di Milano) has adopted the so called 3 + 2 system.

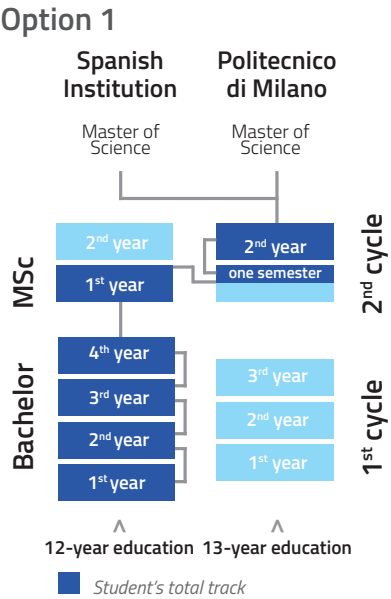


Fig. 2.22 - Another possible Double Degree scheme where the Home Institution is Spanish and the Host Institution (in the specific example the Politecnico di Milano) has adopted the so called 3 + 2 system.

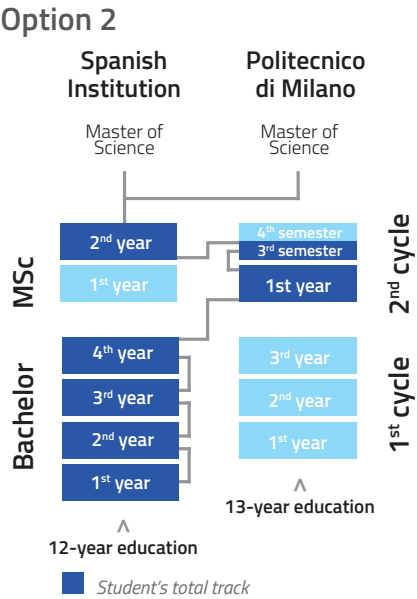
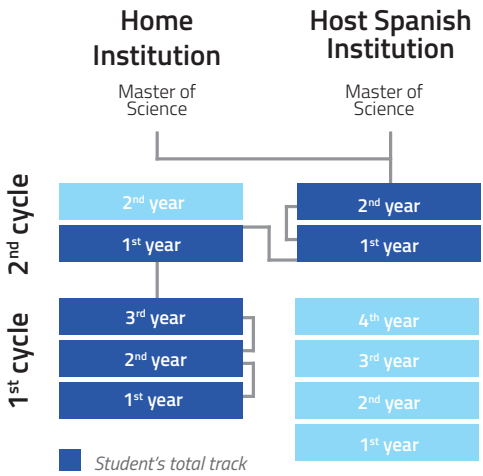


Fig. 2.23 - A Double Degree scheme where the Home Institution has adopted the so called 3 + 2 system and the Host Institution is Spanish.



For the schemes followed by the European Institutions with the North American ones see the already mentioned Chapter "La Arquitectura de los Planes de Estudios Para la Titulaciones Dobles y Conjuntas en Ingenieria: Hacia un Catalogo." by the same Author of this chapter in the book titled "America Latina: Retos y Compromisos para la Internacionalizacion de la Educacion Superior" (2011), Edited by Luis David Prieto M. and Carmen Helena e Pena with the support of Pontificia Universidad Javeriana.

Considering Double Degree exchanges between a South American and an European Institution, one has to take into account the difference of seasons in the two hemispheres and the consequent difference of phase in the academic calendars. That is why different schemes have been implemented, often moving students in the middle of the academic year between the first and the second semester.
There are also other peculiar features of the majority of South American educational systems that justify different schemes. On the one hand, depending on the countries, students enter University after 12- or 11-year education. On the other hand, since Engineering is a regulated profession, it has to be taken into account that the title obtained at the end of the 5-year Bachelor equivalent programme (often called Licenciatura) is the title relevant to the Engineering profession. That is why in most of the cases the schemes have been designed to allow the candidate to obtain that South American title in addition to the second level one of the European Institution (equivalent to a MSc).
One could even say that in some cases the double degree programme is implemented with a mobility having some features of the vertical one.

Fig. 2.24 - An example of a Double Degree scheme where the Home Institution adopted the so called 3+2 educational system while the South American Host Institution has a 5-year Bachelor equivalent course awarding the title professionally relevant for Engineering.

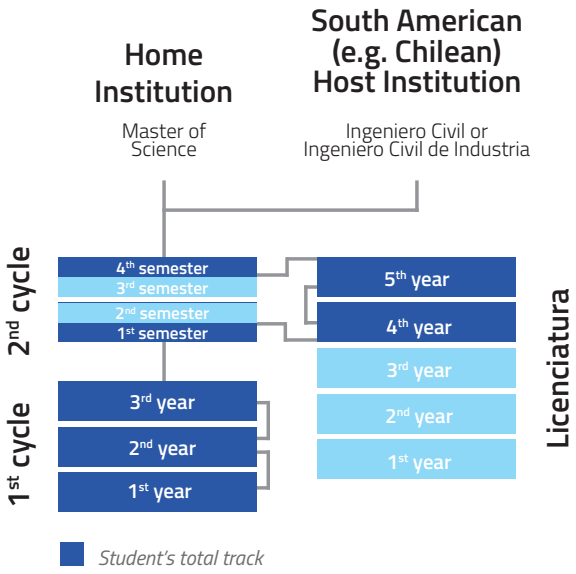


Fig. 2.25 - An example of a Double Degree scheme where the South American Home Institution has a 5-year Bachelor equivalent course awarding the title professionally relevant for Engineering, while the Host Institution adopted the so called 3+2 educational system.

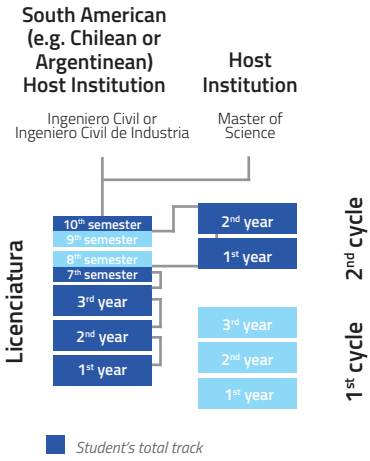
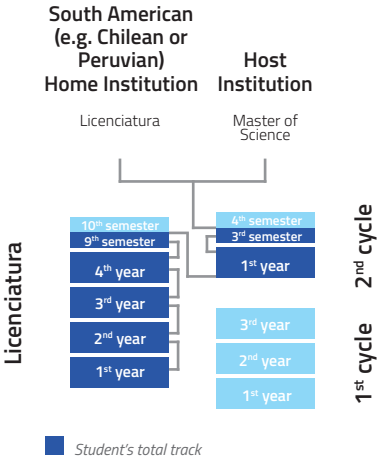


Fig. 2.26 - An example of a Double Degree scheme where the South American Home Institution has a 5-year Bachelor equivalent course awarding the title professionally relevant for Engineering, while the Host Institution adopted the so called 3+2 educational system.



As to Figure 2.26 it must be mentioned that the period at the host institution has been graphically shown as 1st year plus 3rd semester. This refers only to the time sequence. When considering the content, the final thesis work will take the greatest part, when not all, of that 3rd semester. This means that its content will be comparable to that of the 4th semester followed by the local students.

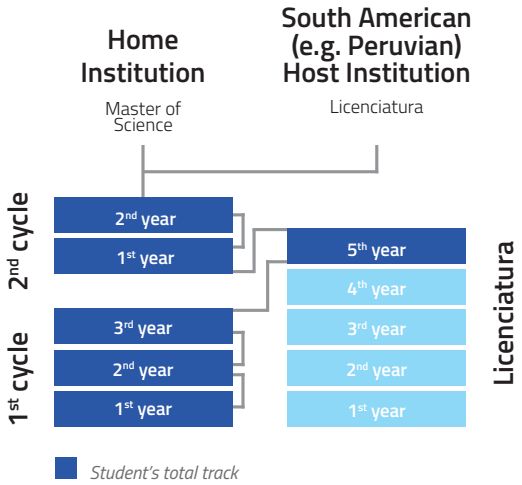


Fig. 2.27 - An example of a Double Degree scheme where the Home Institution adopted the so called 3+2 educational system while the South American Host Institution has a 5-year Bachelor equivalent course awarding the title professionally relevant for Engineering.

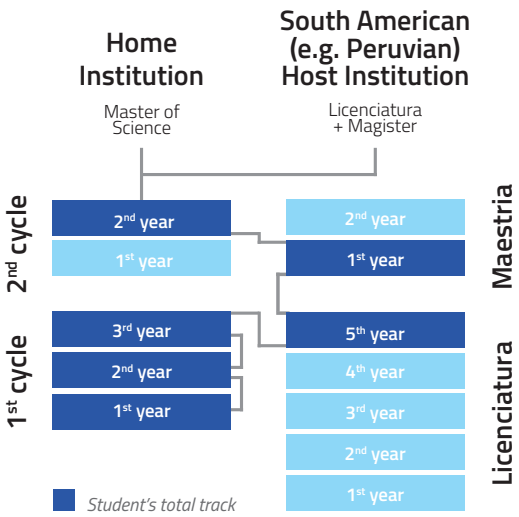


Fig. 2.28 - An example of a Double Degree scheme where the Home Institution adopted the so called 3+2 educational system while the South American Host Institution has a 5-year Bachelor equivalent course awarding the title professionally relevant for Engineering. The graduate is awarded both the Master and the Bachelor equivalent titles of the Host Institution.

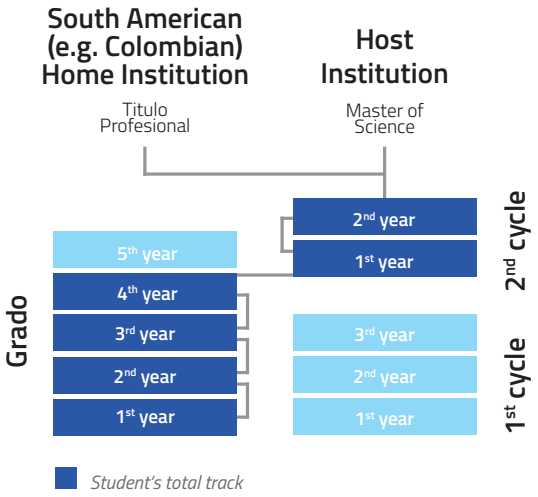


Fig. 2.29 - An example of a Double Degree scheme where the South American Home Institution has a 5-year Bachelor equivalent course awarding the title professionally relevant for Engineering, while the Host Institution adopted the so called 3+2 educational system.

All the schemes shown here have in common to demand of the student some extra workload with respect to the curricula followed by the students who will get only one degree. This is a demand for the T.I.M.E. double degree. Since all the European and one of the South American Institutions member of the ADDE SALEM Consortium are member of the T.I.M.E. Association we implemented our double degrees according to the rules established in the charter of that Association and requested to award the "T.I.M.E. Master Quality Label Certificate". It is given to those graduates who got their degrees from two T.I.M.E. member Institutions and whose curricula fulfil strict and simple criteria established by the Association:

- At least three semesters at the Host Institution.
- At least a total of 360 ECTS credits awarded by the two member Institutions without any double dipping.

In Chapter 4 one can see that such rules have been important issues of the ADDE SALEM surveys and focus groups.

2.5. Joint Degrees at the Master Level

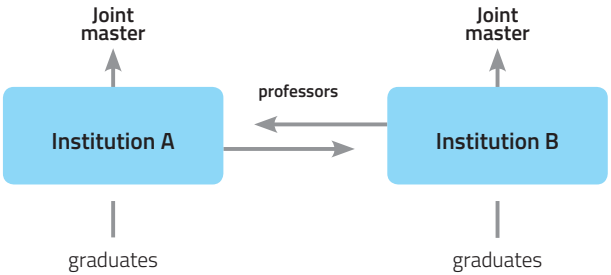
Joint degrees are more and more attractive.

- They can be well defined and visible products.
- They can be done in a maximum of two years after the first cycle (no extra workload).
- They can easily be offered to students coming from a third Institution.
- The internationalization can be obtained by exchanging students for part of the curricula and/or by an extensive practice of teacher's mobility.

The Joint Degrees are generally preferred to the Double Degrees where new curricula are developed together by two or more Institutions in subject areas where the competencies of all the participating Institutions are necessary. In other words we are here speaking, for each case, of a single curriculum offered by two or more providers and that should lead to a single degree. However, one has to take into account that some of these projects, mainly due to legal obstacles at some of the participating Institutions, at present lead to the awarding of two degrees instead of the joint degree. They were studied as joint degrees but, in practice, are administered as double degrees. Obviously, this situation is producing confusion and misunderstandings. Hopefully more transparency will be introduced when the over mentioned legal obstacles will be removed.

Let us mention some examples of Joint Degree schemes, taking into account that here too we refer to the Chapter "La Arquitectura de los Planes de Estudios Para la Titulaciones Dobles Y Conjuntas en Ingenieria: Hacia un Catalogo." by the same Author in the book titled "America Latina: Retos y Compromisos para la Internacionalizacion de la Educacion Superior", (2011), edited by Luis David Prieto M. and Carmen Helena de Pena with the support of Pontificia Universidad Javeriana.
Some Joint Masters have been done by two or more Universities ***by moving the teaching staff only***. On the contrary the student body is offered the courses at the same location.

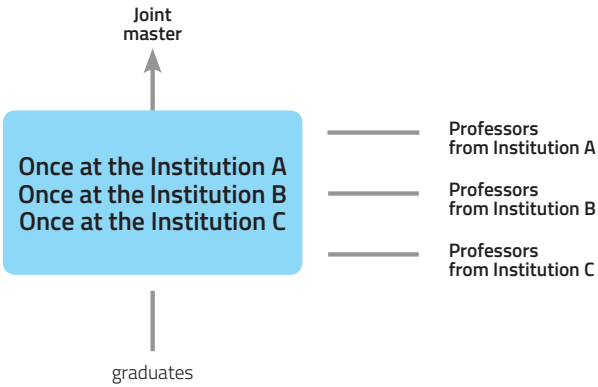
Fig. 2.30 - Example of a Joint Degree where students do not move. A significant number of professors give courses at both Institutions.



One of the advantages of the scheme is that the participating Institutions are permanently involved and that the human resources are shared making it more sustainable. The difficulties of this scheme lie in organizing (particularly synchronizing) the teaching staff mobility and in the relevant costs.

In other cases the courses are offered only at one location at a time, but the location itself is rotating. In other words for the student enrolling in a certain year the location is unique and different from the one offered to the cohort of students enrolling in another year.

Fig. 2.31 - Example of a Joint Degree that is offered each year at a different Institution. The students move to and stay at that Institution. The professors move to that Institution for lecturing.



Among its advantages, one can quote an easier organization of the teaching staff mobility and the fact that every Institution has to organise the courses once every two, three or more years (depending on the number of Institutions involved).
A disadvantage that has surfaced in implementing this scheme is that after some years many logistic and organisational problems have to be solved almost from scratch.

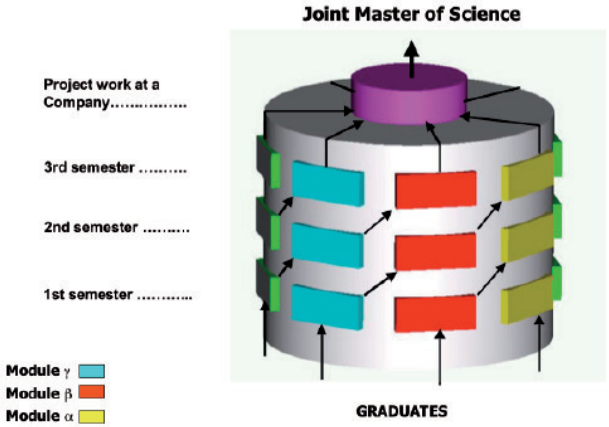
Both schemes of Figures 2.30 and 2.31 are mainly used for intensive courses of relatively short duration (maximum one year).

Other kind of programmes have been designed in which internationalization is obtained mainly ***by moving students***.

There are many options in organizing the teaching and the student mobility. Here two schemes only are shown that seem to emerge as particularly interesting. Both of them consist of three semesters of coursework, each one attended by the students at a different Institution. The fourth semester is an internship at a company (not necessarily in the country of one of the Institutions).

In the first scheme the content of each of the three modules is completely self-consistent and with no need for a time order between them (no propaedeuticity). Each partner Institution will continue to teach the same module both in the first and in the second semester every year. Students will move from one partner to the other.

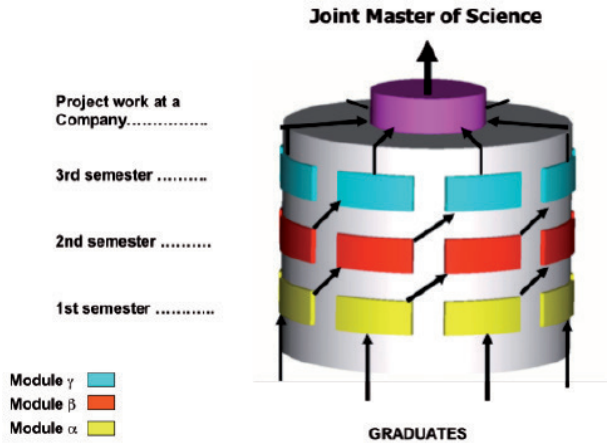
Fig. 2.32 – A Joint Degree scheme. Vertical columns stand for courses taught by the same Institution. A new Institution may be added provided it offers a module that is self-consistent and is fit for the educational purpose of the Master.



This is probably the easiest way to begin with. Indeed one can start with three Institutions only and with one group of students only. In this way it is also possible to agree on the correct sequence and allow for prerequisites to the second module to be taught in the first module and so on.
However, as soon as more than three Institutions participate and/or more than one group of students is admitted (beginning in different Institutions), the modules need to be made independent one of the other and self sufficient (no propaedeuticity) in order to allow for different sequences. This is obviously a serious drawback of the scheme.

The latter drawback is avoided in the second option where each Institution will teach all the three modules, in the three semesters, in the proper order. The groups of students will move from one Institution to another when moving from the first to the second semester and from the second to the third semester.

Fig. 2.33 - A Joint Degree scheme. Vertical columns stand for courses taught by the same Institution. All the Institutions provide the three modules in the right sequence over three semesters. A new Institution, and a new group of students may be added.



The coursework can be planned with propaedeuticities making the educational path more efficient. Moreover the Consortium can easily add a new member Institution (offering the same three modules). In Fig. 2.33 it simply amounts to increasing the radius of the cylinder and adding a new column maintaining the conceptually correct order of the modules.

More resources are needed than in the scheme of Fig. 2.32 since each Institution has to offer all the modules, and a very strict coordination between teachers of different Institutions is essential.

Some examples only have been shown just to mention the main categories of Joint Degrees that are flourishing at an almost incredible pace.

2.6. Double and Joint Doctorates

Doctorates are the natural ground for interaction between research and education.
Research mobility at the doctoral level has always existed, but it is in the last years that exchanges involving the awarding of the titles (Joint and Double Doctorates) gained popularity. The ERASMUS MUNDUS programme gave a great incentive to those projects including Action 1B EMJD (ERASMUS MUNDUS Joint Doctorates).
Even within the T.I.M.E. Association a working group was established that prepared a questionnaire and organized a Ph.D. Conference (Lausanne, May 2009) where some principles for the policy of the Association towards Double and/or Joint Doctorates were examined. Doctoral programmes are quite different even among the partners of the ADDE SALEM Consortium. That is why chapter 8 deals with a survey on doctoral programmes that we did among our partner Institutions.
As to a more complete discussion on the Joint Doctorates see Spinelli (2011).
Here we only mention few schemes that are relevant to the surveys done in the ADDE SALEM Project.

The most classical one (Fig. 2.34) has a very simple architecture. The duration of one and a half year at each institution for the two initial blocks is indicative. Generally, the agreements say that the first phase covers at least three years of which not less than one has to be passed at each Institution. When at least one of the two Institutions requires some coursework it has to be completed during this phase.
The extra fourth year is often requested in order to justify the two titles. On this requirement and on that of two thesis works there is not a universal consensus.
This scheme for Double Doctorates has already been experimented for more than fifteen years by some of the European Institutions of our Consortium with some partner Institutions even in South America. The results are very satisfactory. However the num-

ber of graduates involved has remained very limited due to the difficulties in financing them.

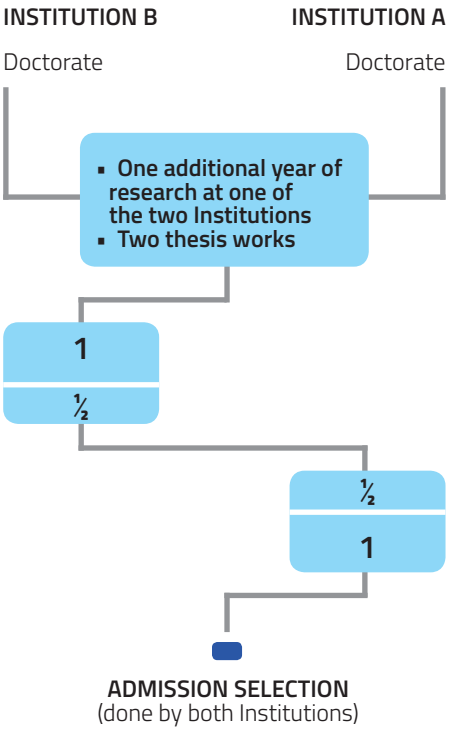


Fig. 2.34 – A Scheme of a Double Doctorate

Let us only mention another possible scheme that can be implemented in the framework of a Consortium of Institutions.
The leading vision is that , at the doctoral level, the name of the game is "quality of research".
For an Institution, designing, setting up and implementing Joint and Double Doctorates have many advantages, particularly in a long term perspective.
However, as to the candidates, the value added with respect to a doctorate awarded by a single Institution must be clearly visible and relevant.
The following scheme can be implemented in a research area wide enough as to include different spe-

cific topics where excellence is achieved by different partners of the Consortium.

The consortium will provide methodology courses to all the candidates in a common environment. Each year, for the new cohort of candidates, the provider of such a coursework will be a different member Institution.
Each candidate will begin his/her doctorate by staying three months with one of his/her two tutors who will introduce him/her to the subject of the research, and to the need of methodology tools.
After that period all the candidates will move to the Institution providing the methodology courses. They will study together, get to know and form a community that will afford very different research but with a shared set of methodology tools.
For the remaining duration of the programme, the candidate will stay at the Institutions of his/her two tutors according to an agenda individually established. During this last, and longer period, events like summer courses will be organized to have all the group meet again periodically.

Fig. 2.35 - A scheme of a Joint Doctorate in a thematic consortium. The two tutors pertain to the Institutions A and B. Institution C is providing the methodology coursework.

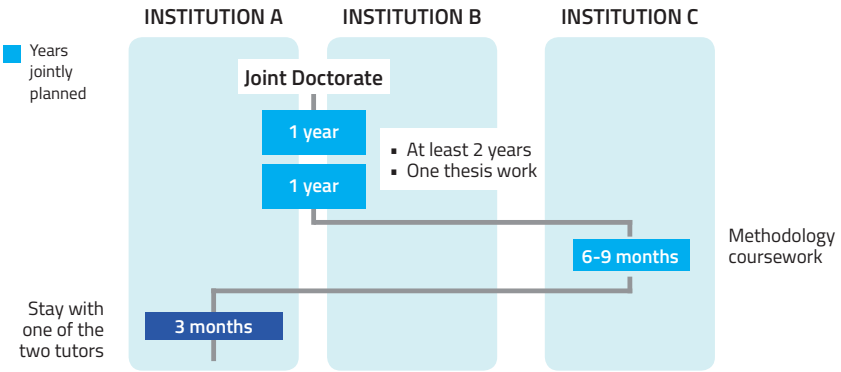
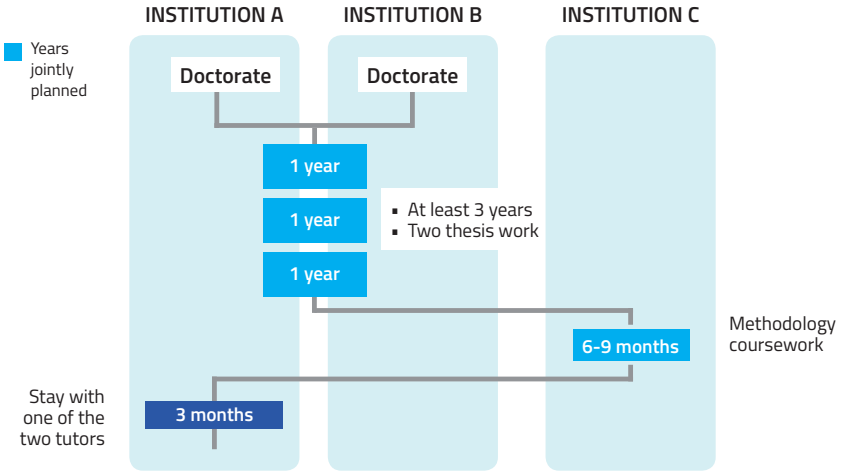


Fig. 2.36 - A scheme of a Double Doctorate in a thematic consortium. The two tutors pertain to the Institutions A and B. Institution C is providing the methodology coursework



The model has not yet been implemented with South American Institutions, but it is seriously considered as the next step by Consortia where research cooperation already exists and it has been possible to verify that:

- The partners of the Consortium have complementary competencies in the chosen, wide research field.
- Specific research teams, even if quite different, share most of the methodologies.

Author Note
I thank Francesca Fogal and Maria Perego (Politecnico di Milano) for stimulating discussions, and Cristina Giannetto for the preparation of the schemes.
Some of the schemes have also been presented (with slight differences) to the conferences of AIEA or EAIE or NAFSA.

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3.

Simple Guidelines for Double and Joint Degrees

Fouad Bennis
École Centrale de Nantes, Nantes, France

Barbara Del Sole
Politecnico di Milano, Milano, Italy

Vitor Amaral
Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil (revision)

Double Degree

Since a great ambiguity exists both in terminology and in ways of implementation we are here explaining the framework within which the ADDE SALEM study has been carried on.
In the ADDE SALEM consortium we assumed the following criteria to define a **double degree programme**.

- Two academic partners located in two different countries.
- Two formal full- fledged academic degrees awarded.
- Well defined workload that permits the awarding of the two degrees.
- Physical mobility to the foreign partner for a duration allowing students to be deeply exposed to the culture of the host country.
- Student centred agreement.

Partnership agreement
A Double degree agreement defines the student exchange procedures and generally concerns the students already enrolled at one of the two partner institutions.

Number of countries involved in the partnership
The double degree programme involves two HEIs from two different countries.

Cycle and degrees awarded
The double degree programme may be organised involving two programmes of the same cycle at the two institutions (Bachelor-Bachelor, Master-Master or PhD-PhD) or across two cycles (Bachelor-Master or Master-PhD).
Consequently it will lead to two degrees at the same or at the two different levels.

Curricular content
The student benefits from the specificities of each institution: he/she takes more advantage of the differences than of the similarities.

Schedule of graduation
The double degree agreement specifies when each of the two degrees has to be awarded. In some cases each degree is independently awarded as soon as the student satisfies the requirements of the relevant institution. In other cases the awarding of both degrees is delayed to the completion of the agreed curricula at both institutions.

Aims
The double degree programme is set up to respond to specific needs of the two countries or to the demand of international companies, provided that the companies' and HEIs' expectations are accommodated.

Fees
The students pay the fees (if any) only at the home institution.

Accreditation
Each individual degree awarded is fully accredited by the country of the awarding institution.

Study programme
The double degree curriculum is established across the study programmes of the two institutions. Generally these programmes already exist. The study pro-

gramme may be based in some part on the similarities and in some part on the complementarity of the existing curricula at the two institutions.

Field of study

The fields of study are generally similar. However, in some cases, double degree programmes across disciplinary macro areas have been implemented.

International mobility

The double degree programmes require physical mobility (mainly horizontal) as an essential part of the curriculum.

Recognition of credits

In order to award the two degrees, the two institutions involved in the partnership totally recognise the study period spent at the other institution even if some extra workload is required with respect to the one necessary to get only one degree.

Workload (duration/credits)

The double degree workload is generally less than the sum of the two individual workloads required at each institution. The amount of workload to be added to the one necessary for the student to obtain a single degree is the most important open question in designing double degree programmes. Although it is well known that many double degree programmes offered to students in Europe and across the continents do not require any additional workload, ADDE SALEM (as always done by the T.I.M.E. Association) advocates additional workload as essential to the process.

Selection process / Recruitment

Students are selected among the ones already enrolled at one of two institutions. The home institution recommends them for the double degree exchange to the host institution.

Number of students involved

Generally the agreement fixes the maximum number of students to be exchanged every year.

Mobility scheme

The double degree agreement defines the schemes of mobility that can be adopted (for examples, see chapter 2).

Enrollment

As soon as the student is accepted for the double de-

gree programme, he/she is registered as regular student also at the host institution until the end of the programme.

Staff mobility

The majority of double degree agreements do not include staff mobility for teaching activities.

Evaluation and teaching methods

The two individual study programmes are evaluated separately. The students benefit from the two educational approaches and expertise.

Language of instruction

Language of instruction at each of the two institutions has to be specified in the double degree agreement.

Learning outcomes

By awarding their degrees both institutions certify that students registered in the double degree programme have acquired the skills and competencies necessary to receive each degree.

Joint Degree

In the ADDE SALEM consortium we assumed the following criteria to define a **joint degree programme**:

- Two or more academic partners located in at least two different countries.
- One formal full- fledged academic degree.
- One (new) integrated workload.
- Physical or virtual mobility to the other partners.
- Institutional centred agreement.

Partnership agreement

The joint degree agreement deals with one unique study programme in the framework of a cooperation between two or more institutions. It is particularly meaningful where it develops a new study programme that takes advantage of the complementarities of the participating institutions. The partners agree on who leads the consortium and the study programme.

Number of countries involved in the partnership

Two or more.

Cycle and degree awarded

The joint degree agreement concerns only one cycle (Bachelor, Master or PhD).

Certification awarded

The number of certificates awarded may vary. The most common cases are:

- One joint full-fledged degree is awarded on behalf of all the higher education institutions in the consortium.
- A joint degree is awarded by those higher education institutions that offer the programme (but not necessarily by all the higher education institutions in the consortium).
- A joint degree is awarded on behalf of all the higher education institutions involved in the consortium in addition to the national degree of one or some of them.

Aims

- Increase internationalisation at the institutions.
- Increase transparency between educational systems.
- Develop study and research alternatives in accordance with emerging needs.
- Offer students an expanded and innovative arena for learning.
- Increase competence at partner institutions through cooperation and implementation of a better practice system.
- Increase the institutions' ability to change in step with emerging needs.
- Contribute to tearing down cultural barriers, both personal and institutional.

Fees

The partners agree on the fees to be charged to all the students registered in the joint programme.

Accreditation

The joint degree must be accredited by at least one country or by a supranational institution.

Study programme

A well-defined curriculum integrating competencies of the participating institutions is clearly defined and offered to the students.

Field of study

The field of study takes advantage of the complementarity among the partner institutions and generally aims at responding to emerging subject areas.

International mobility
The physical mobility is generally the practice but the use of virtual mobility is acceptable.

Recognition of credits
Since it is a single programme with more than one provider all the rules must be established in advance.

Workload (duration/credits)
Workload and duration of a single degree apply.

Selection process
The selection is jointly organised and managed.

Country of origin
The joint degree programme is not limited to students from the partner institutions. On the contrary it mainly aims at attracting international students.

Mobility scheme
Very many schemes can be implemented. For some examples see chapter 2.

Enrollment
One can find several solutions, among which:

- All the students are registered in all the partner institutions for all the duration of the programme.
- The students are registered only in the institutions that award the degree.
- The students are registered in all the institutions where they study through physical or virtual mobility.

Staff involvement and mobility
Joint programmes are demanding in terms of human resources since new programmes have to be studied, agreed upon partners and implemented. Virtual or physical staff mobility is very often implemented.

Evaluation and teaching methods
Both are managed by the consortium.

Language of instruction
The majority of existing joint degree programmes are taught in English.

Learning outcomes
The expected learning outcomes are agreed upon the partners of the consortium when establishing the integrated curriculum.

TEN CRITERIA TO DEFINE A DOUBLE OR A JOINT DEGREE PROGRAMME

For sake of simplicity and in order to provide a quick reference, here following, we give a table summarizing ten criteria to define double or joint degree programmes.

	CRITERIA	DOUBLE DEGREE PROGRAMME	JOINT DEGREE PROGRAMME
1	Number of degrees	Two formal full- fledged academic certificates/ qualifications awarded on completion of an integrated curriculum at two participating institutions and agreed upon them. Each degree is officially recognized in the country where the degree-awarding institution is located.	One degree awarded on completion of an integrated curriculum at two or more participating institutions and agreed upon them. The degree is officially recognized in at least one of the countries of the degree-awarding institutions.
2	International Mobility	Physical mobility For international double degree curricula it is compulsory for the students to make a physical mobility period in the country where the second degree-awarding institution is located. Staff mobility is generally not foreseen. *Definition of mobility:* Moving physically to another country (for an established period), in order to undertake study, work experience, research, other learning activity as part of the study programme the student is attending.	Physical/Virtual mobility The physical mobility is not compulsory (Knight 2011). Virtual or only staff mobility are admitted.

3	Field of study	It can be in the same field or across complementary ones.	Generally in one field.
4	Workload (duration/ credits)	The duration of the period of study may be extended beyond the length of a single degree programme. Some consortia of Institutions requires an additional workload, others do not. For example the T.IM.E. Association requires an additional workload equivalent to one year (60 ECTS). In the ADDE SALEM projecty we considered DD curricula with additional workload.	No additional time, no additional credits compared to the single degree.
5	Level/Cycle	In the same cycle or across two cycles (EQF level 6-7-8).	In the same cycle.
6	Recognition of the period of study	Full recognition of the study abroad.	Given the level of integration, there is no need to have a recognition process.
7	Student enrollment	Student must be registered in one of the two partner institutions involved before applying for the double degree programme. Once accepted the student is also enrolled at the host institution.	Student directly applies for the joint degree study programme No need to be student of one of the institutions of the consortium before applying. All international students can apply.
8	Mobility scheme	Specified in the agreement between the two partner institutions.	Already defined (if any) with the integrated curriculum.

9	Recognition of degree	No need. Each one of the two degrees is already fully-recognized by the country where the awarding higher education institution is located.	Very often it is still an open issue. The aim is to have the joint degree fully recognized by the countries of the participating institutions.
10	Degree of integration of the curricula	Highly integrated curricula – by complementarity or by similarity.	A single integrated curriculum agreed upon by the provider institutions.

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4.

Methodological Design

Jesús Arroyave
Universided del Norte, Barranquilla, Colombia

The following section will explain the procedure and conceptual bases for the design and implementation of instruments used to establish and collect key information needed for the ADDE SALEM project (**A D**ouble **D**egree in **E**urope, **S**outh **A**merican **L**eadership and **EM**ployability). The ADDE SALEM project aims to promote ERASMUS MUNDUS joint and double degrees between European and South American institutions. ADDE SALEM focuses on engineering and related disciplines and works in four South American countries (Argentina, Brazil, Chile, and Colombia). The main goal of the project is to enhance European curricula for double degree programmes to better serve the employability and career prospects in South America for engineers graduating from these programmes.
Since the project uses mixed methods for data gathering, the first section of this chapter will describe the process of designing and testing instruments based on international professional standards for engineers and on surveying the expectations and needs of the current markets in Latin-America. The qualitative methodology of this project relies primarily on focus groups. The second section of this chapter will thus describe the procedural elements of focus group design and implementation and the tools used for the analysis of focus group data.

4.1 Quantitative approach

The first step was a systematic review of existing literature with the purpose of identifying needs, skills, and abilities at a global level and then in the specific case of South America. The following step was to identify the core skills and abilities. Core skills were identified drawing from the international CDIO syllabus and skills specific to engineering were also taken from those established by Accreditation Board for Engineering and Technology (ABET) . CDIO (Conceive, Design, Implement, Operate) refers to an international project aiming to create a universal curriculum with a generic set of goals established for undergraduate engineering education. Some of the main skills identified were: core math skills, analytical reasoning and problem solving, and ability to validate the performance of systems.

Drawing from the literature and the identified skills, survey questionnaires were developed for three of the main stakeholders: employers, alumni, students. In the case of employers, the questions explore the skills needed and required from engineers they would employ. Hard and soft skills were both explored in detail by the instrument. Hard skills refer to specific knowledges related to engineering as a discipline, for example "abstract reasoning, analysis, and synthesis" and "designing and building of systems, processes, and products". Soft skills are more general skills not related to the specific subject areas. They include, for example, interpersonal, social, and communication skills.

In order to better identify the scope of each stakeholder, when the study mentions employers it refers to organizations that hire or are currently thinking to hire engineers. Alumni refers to individuals who have participated in and completed double degree programmes. Current students refers to students who are currently participating in double degree programmes between European and South American institutions. Finally, faculty/administrators refers to professors and administrators who are involved in the process of facilitating double degree programmes between European and South American institutions and

tutoring students in international programmes. Due to operational procedure the questionnaires focused on three stakeholders: employers, alumni and students.
The thematic areas combine the general requirements from the CDIO and ABET and the key learning outcomes for global education and learning (Culver et al., 2011). In regards to engineering standards, the survey measured general skills such as "knowledge of statistical and mathematical methods" and "knowledge of information technology and software", and subject specific skills such as "ability to design and build systems, processes and products" and "ability to identify, select, and apply emerging technologies". As for the skills related to global learning, the survey measured different sets of skills. For instance, decision making ones such as "analysing risks" and "developing sustainable solutions" and also communicative skills and ethical thought. Many of the global learning outcomes are also listed in the CDIO and ABET standards. Given the international dimension of the project, desired, required, and acquired language skills were added to this area. Language skills were listed as part of the skills related to the communication dimension.
The questionnaires were validated by an international group of scholars. Once the instrument was assessed, core skills were established and communicated to other members of the research team. An operational matrix specifying each thematic area as a variable was created. The matrix included an operational definition and dimensions for each of the thematic areas, including specific indicators for each of the dimensions listed. Questionnaires were developed by an expert in social science research and engineering faculty members. Skills were divided into and operationalized within four thematic areas: (1) learning to know, (2) learning to do, (3) learning to live together, (4) learning to be. These four areas are the pillars of global learning proposed by UNESCO.
The first area focused on advanced knowledge, measured through three indicators: 1) abstraction, analysis and synthesis skills; 2) advanced knowledge on research and analysis methods; and 3) knowledge of information technologies and tools. The second area

was divided into four dimensions : 1) experimentation and research; 2) design, development, and management of systems, processes, and products; 3) enterprise, business, and entrepreneurship; 4) social and environmental context. The third area focused on three aspects: teamwork, communication skills, and ethics and responsibility. Finally, the fourth area focused on analytical reasoning and problem solving.

Commissions of experts were formed to measure and analyse each of the variables and the dimensions, indicators, and items within it. There was one commission evaluating items pertaining to knowledge (learning to know), one for practical abilities (learning to do), one for social skills (learning to live together), and one for analytical and problem solving skills (learning to live). Each commission evaluated whether the variables were coherent with their definitions, dimensions, indicators and items. A plenary section was held in order to collectively evaluate and agree upon the final items for each area. Working within and between commissions, instruments were refined based on results and the final instrument was created.

Each version of the questionnaire was divided into five sections: A-E. Section A contained general information. In the employer survey general information included: Country, Economic Activity, and Classification (local, national, international, multinational). As for the alumni survey general information included: name and country of home institution (South-American) ; name and country of host institution (European); year of start and year of end of the double degree programme; whether the respondent is currently employed or not; if currently employed: current salary, time of employment, and name of employer, current position, area of work, and employer's classification (local, national, international, multinational) . Section B addressed motivations. For the employers' survey the motivation section is divided in two sets of items: the first set tries to measure whether and with what frequency employers tend to hire professionals with double degrees. The second set asks employers to select from a series of skills which ones provide added value to hiring professionals with double degrees.

For the alumni survey, section B asked what motivations led professionals to pursue double degree with European institutions and what they believe was the impact of having completed a double degree. Section C of the survey focused on language skills. For the employer survey, this section asked which languages were required by the company in order to hire an engineer with a master degree. For the alumni survey, we also asked the improvement of respondents language skills as a result of participating in a double degree programme at an European institution.

Section D measured career and employability of engineers with a double master degree. In the employers survey, this section focused on employers willingness to hire and compensate an engineer with a double master degree and their perceptions of the benefits and risks of employing them. For the alumni surveys, section D asked about perceptions of benefits and risks of doing a double degree at the master level, current work situation and location, and impact of the double degree in the participant's work situation- both current and aspirational-.

Finally, section D measured variables related to the skills sets drawn from the CDIO and ABET standards and the new global learning standards. Section E consisted of a Likert scale questionnaire in which respondents rated skills and competencies on a scale. In each survey, skills were rated on two criteria: importance of the skills for employment and career, and level of satisfaction with these skills. For employers, satisfaction referred to the current pool of employees at their companies and in the market, whereas for alumni their satisfaction was measured in relation to their own skill set after completing their double degree.

The instrument was first tested at a job fair in Santiago, Chile. A group of employers and alumni that took part in this fair responded to the questionnaires. Based on results from this initial testing the instrument was modified and later on sent to all participating Universities in South America. Once the instrument was finalized, universities in each partner country proceeded to gather data among the most important organizations. One institution from each partner country was

charged with gathering all the data for the four countries and entering it into a template that was specifically designed for the project. Data were then analysed using different statistical procedures.

4.2 Qualitative approach

For the qualitative section, focus groups were developed in order to gain deeper insight on each of the thematic areas. As a methodological tool, focus groups allow researchers to observe the "whys" underlying trends and relations identified through quantitative methods. Focus group questions were taken from and aimed at elaborating on findings from the surveys. Moderators for each focus group drew from quantitative findings to guide the discussion. Discussions, however, were semi-structured rather than fully structured. That is, while guided by questions drawn from quantitative data, other questions were also taken from insight given by participants in-situ, and discussions could deviate from established prompts. As for recruitment, each country invited engineers and employers based on their profile, qualification, and international experience.

Focus group data were analysed using a thematic analysis. Thematic analysis of the focus group consisted of three steps: transcribing recordings from the focus groups; highlighting commonly occurring information and topics of discussion; and developing themes through which data can be grouped and categorized. Common and recurring themes were drawn in two different ways: first, using each of the thematic areas that informed the survey design as categories. Second, by organizing and connecting emerging patterns from the data.

Following the organization of data and development of themes, each theme was interpreted in relation to contextual elements. In the specific case of the ADDE SALEM project, the contexts implies to try to point out the key assumptions about issues such as perception about double degree programmes, advantages or disadvantages of professionals with double degree, specific training needs according to the characteristics of the country, importance of hard and soft skills in engineering education, and competencies that employers valued most when they hired engineers.

5.

Skills and Competencies Acquired by South American Students through Double Degree Studies in Europe – a survey study

Per Warfvinge
Lund University, Lund, Sweden

Giancarlo Spinelli
Politecnico di Milano, Milano, Italy

ABSTRACT

Double degree programmes in engineering involve bilateral arrangements between international higher education institutions (HEIs) and are intended to prepare graduates to work in a global job market. The study was part of the ADDE SALEM project which mainly focuses on South American students who go to European institutions to obtain a double degree in engineering at the master or PhD level. The aim was to investigate if such double degree programmes match the students' expectations, if the perceived added values match the demand of the employers, as well as motivation of students, possible constraints and the development of language proficiency. The survey addressed current South American engineering students (from Argentina, Brazil, Chile and Colombia) engaged in double degree studies in Europe, alumni among South American engineers that have completed dou-

ble degree studies in Europe and employers, hiring engineers based in South America. Students enroll in to gain personal development, and better career options. All stakeholders accept that the studies are prolonged by two semesters, preferably partly as an internship. There is little risk in doing a double degree, although the understanding of these degrees among employers is very low. In particular, South American double degree students going to France and Italy become tri-lingual, including a profound and very valuable improvement in their English. Students and alumni share expectations and experiences of the added value obtained, while the picture provided by the employers is more vague. Important added values include ability to work in an international context, respect for multiculturalism, teamworking, communication skills and internal drive. In conclusion, it is justified to continue to develop and market double degrees in engineering, although the graduates are not *a priori* more marketable.

5.1 INTRODUCTION

Collaborative educational programmes involving bilateral arrangements between international higher education institutions (HEIs) are intended to prepare graduates to work in a global job market. Their stated intent is to provide extensive international and professional experiences that enhance the employability of graduates. The existence of joint/double degrees may, parallel to expanding globalization and internationalization, even enhance the development of a more global job market (Sursock and Smidt, 2010).

In general terms, international experience enhances employability. A majority of former ERASMUS students and employers surveyed by Tischler and Janson (2007) claim that internationally experienced students tend to be superior in many professionally relevant competencies than formerly non-mobile students. A study by the Confederation of Swedish Enterprise (2010) showed that studies abroad have a positive effect on the student's chances in the job market af-

ter graduation, that students develop communicative skills, social competence, flexibility and initiative ability during time abroad and that mobile students get higher entry pay.

A collaborative programme leads to one or, more commonly, multiple degrees issued by at least two universities. This study deals with double degrees, defined by Knight (2011) as "A double degree programme awards two individual qualifications at equivalent levels upon completion of the collaborative programme requirements established by the two partner institutions." In practice the student fulfills the requirement of the two separate qualifications/degrees by means of mutual recognition of earned credits. The partner HEIs thereby handles the formalities independently of each other. A double degree programme thus involves a "home university" where the student is originally enrolled and where the main parts of the studies are completed, and a "host university" where the student spends a more limited period.
Double degree studies typically take longer to complete than each of the nominal study times for each degrees in question and consequently require more investments in time and money for the students.

In this context, double degree should not be confused with the phenomenon common in Australia, where double degree refers to two bachelor degrees studied concomitantly over an extended period of time (Russell et al. 2007).

In contrast, the term joint degree is used to signify when a student completes one study programme, receiving one jointly issued degree certificate at graduation. The degree certificate may encompass two nationally accepted, and hence different degrees, but the point is that it assumes a joint effort from beginning to end. Since virtually all degrees issued rely on a national qualification framework, it presumes that countries allow "true" joint degrees were the legal capacity to deal with a national degree is handed over to a foreign authority. As described by Davis (2009) the legal situation

in Europe with respect to joint degrees is very diverse. To reinforce European presence in the world of higher education, the European Commission has actively promoted and financially supported opportunities for joint activities outside the Union. In this context, the most relevant are the collaborative degrees funded via ERASMUS MUNDUS Action 1, within which multiple degrees are issued: joint or double master degrees, and joint or double degree PhD always involving at least three institutions. During the academic year 2013/2014, 138 such programmes were supported (European Commission, 2014).

Double degrees are common in engineering. For example the 52 universities within the T.I.M.E. Association (Top Industrial Managers for Europe) have already issued double degrees to around 5000 graduates since the beginning of the activities in 1988. The degrees are based on bi-lateral agreements, and the mobility models may vary in order to accommodate for national constraints, institutional strategies and student demands.

The learning outcomes associated with double degree programmes may be very deliberate or quite *ad hoc*. On one extreme we find the ERASMUS MUNDUS joint programmes where the learning outcomes of each course module are aligned towards the programme learning outcomes. On the other end we find most T.I.M.E. double degrees, where the mobility period is at least three semesters and it is expected that the students need to invest at least a full year of studies on top of the nominal study time at the home university. Arguably, within the T.I.M.E. Association, the amount of workload at the host university is the central focus and complementarity of learning outcomes of the degree programmes in question is assumed to be a consequence.

Double degree programmes between South European and South American institutions have been in place for several years (Spinelli 2011). This may not be surprising considering the historic, cultural and linguistic ties

that exist. Northern European universities have less engagement in such double degrees, arguably since teaching is partly conducted in Germanic languages.

The study presented here was part of the ADDE SALEM project. ADDE SALEM was funded under the European Life Long Learning programme, more precisely the policy-oriented ERASMUS MUNDUS Action 3. The objective of the project has been to promote collaborative degree initiatives between European and South American institutions. The focus has been exclusively on engineering, and the universities involved have been either technical universities or comprehensive universities with quite autonomous engineering schools/faculties. South American partners included eight universities, two from each country, from the four most developed economies in South America: Argentina, Brazil, Chile and Colombia. On the European side, partner institutions were from France (3), Hungary, Italy, Portugal, Spain and Sweden. Lead university was Politecnico di Milano, Italy.

One underlying assumption that formed the rationale for the ADDE SALEM programme is the concern that, considering South America as a whole, double degree studies in Europe by South American students would give rise to brain drain of highly qualified engineers. The argument would be that the general economic development has come further in Europe. On the other hand, and as an example, since 1987 the GNP growth of Chile has each year been higher than in OECD, and from 1996 higher than in EU-27 with the exception of 1999 (REF OECD). Currently the economic prospects may appear far more positive than those of certain Mediterranean countries represented in the ADDE SALEM project. But regardless of temporal economic fluctuations, it is important to address the issue weather South American students will find it more or less easy to get established on the domestic labor market after completion of a double degree programme in Europe.

A study by Culver et al. (2011), based on data from

the project Evaluate-E that examined the strengths and weakness of a sample of existing programmes at the master and PhD levels in engineering, considered the perceptions of four key stakeholder groups in such programmes. These comprised of currently enrolled students, alumni, faculty and employers that could potentially hire double degree graduates. The conclusions from surveys and focus groups were that "the benefits of a dual degree perceived by all of the stakeholder groups related more to personal growth, communication skills, and cross-cultural skills and less to subject matter or professional knowledge growth", that "the added value comes directly from experiencing a degree programme in two cultures" and that "there was no evidence provided by any of the stakeholders that participation in a dual-degree programme increased a student's marketability".

The current study bares several similarities with the Evaluate-E project and the study by Culver et al. (2011). One difference is that in this study, the questions in the surveys used are fewer, the groups are more homogeneous and the number of respondents is larger. Focus groups conducted within the ADDE SALEM are reported in the following chapters.

Collaborative educational programmes involving bilateral arrangements between international higher education institutions (HEIs) are intended to prepare graduates to work in a global job market. Their stated intent is to provide extensive international and professional experiences that enhance the employability of graduates. But as Knight (2011) points out, an institutional driver to engage in double and joint degree programmes is to increase their reputation and ranking as an international university, which is accomplished by deliberately collaborating with partners of equal or greater status. In the current project we therefore focused entirely on drivers, risks and added values of double degrees for external stakeholder groups.

In the context of double degree studies in Europe by South American students in engineering, this paper

addresses the following primary research questions:

- Do the expected added values, with respect to subject oriented and generic skills and competencies of double degree studies match the students' expectations?
- Do the perceived added values, with respect to subject oriented and generic skills and competencies, of a double degree match the demand of the employers?

We also explore secondary research questions such as the motivation of students, possible constraints and effects of programme design on employability. The data origin from surveys of current students, alumni and employers from four South American countries: Argentina, Brazil, Chile and Colombia as well as Peru. Graduates from institutions of these countries had completed double degrees with partner institutions in France, Italy and Spain.

5.2 THE SURVEY STUDY

The study gathered survey data during the academic year 2012/2013 from three stakeholder groups:

1. Current South American engineering students engaged in double degree studies in Europe.
2. Alumni among South American engineers that have completed double degree studies in Europe.
3. Employers who hire engineers based in South America.

5.2.1 The survey

The questions in the survey formed five groups:

1. Background information.
2. Motivation.
3. Language skills.
4. Career and employability.
5. Skills and competencies.

The questions sometimes contained several items and were expressed in different formats, for example open answers, multiple-choice and Likert type questions with multiple answer option items. This means

that some of the data lend themselves to qualitative analysis. In some cases percentages of different answers can be compared, while others can be subject to a more rigorous statistical analysis.

The questions dealing with skills and competencies aimed at addressing the primary research questions. One important aspect was to be able to contrast the responses of the three stakeholder groups to each other.

For the survey, question items of 19 different skills and competencies were included. These fell in the broad categories of UNESCOs four pillars of education (Learning to know, learning to do, learning to be, learning to live with others), but were subjectively phrased. The final set of items represents a synthesis of typical learning outcomes associated with engineering programmes at master level, sometimes codified in frameworks including CDIO (Worldwide CDIO Initiative, 2014). The entire set of skills and competencies addressed is found in Table 5.4.

The stakeholder groups have different as well as overlapping experiences from the double degree studies: risks, employment, value added etcetera. These differences were captured according to different dimensions. Table 5.5 summarizes these dimensions for the different stakeholder groups. With respect to skills and competencies, the dimensions are expanded relative to the ones employed in Evaluate-E (Culver et al. 2012). Students were asked for perceived improvement, alumni for their level of preparation and employers for importance. It should also be noticed that employers were not asked to evaluate only added-value specific to double degrees since that would limit the number of informed respondents severely.

Starting with the students, they were asked to contrast their "home" experience to their double degree experience. The objective was to identify areas of perceived added value, as expressed by individuals who are currently strongly engaged in the programme, ac-

ademically as well as – most probably – emotionally. The alumni were also asked to rate the perceived added value of their double degree studies. In this way it was possible to identify any significant differences relative to the perception of current students. There were reasons to assume that alumni could develop other perspectives on their double degree experience following graduation. Alumni were also asked to rate the importance of certain skills and competencies to the requirements for their job.
This could be contrasted with the views of the employer group, which focused on the most important skills and competencies for engineers, as well as the gaps in such factors experienced among job-seeking candidates.

The full surveys are available on **www.addesalem.org**.

5.2.2 Stakeholder groups and collection of data

The responses were gathered by actually meeting or talking to the individuals responding, hence not through web-based surveys or by similar methods. There were three reasons for using this more elaborate sampling strategy. One was that the universe of potential respondents is limited and hence the response rate needed to be high. Another was to avoid misunderstandings of terms, and yet another was to get immediate feedback and to pick up ideas that fell outside the survey.

As shown in Table 5.1, the student group consisted of students doing their double degree studies in France and Italy. The survey was distributed at, and by, the host (European) institution. The numbers reflect the state of maturity in the bi-lateral relations. For example, all Colombian students carried out their double degree studies at Politecnico di Milano (POLIMI). In contrast, almost 2/3 of the data relevant to Brazil came from students in France. Here, the main home universities were Universidade do São Paulo (10 students), Universidade Estadual de Campinas (10), Universidade do Rio Grande do Sul (7) and Universidade Federal do Rio de Janeiro (6). The corresponding host

institutions were the Écoles Centrales in Nantes (23 students), Lille (14), Paris (3) and Marseille (2). A very high proportion of the South American students who are presently engaged in double degree programmes at the Écoles Centrales and POLIMI were surveyed.

Table 5.2 shows the distribution of surveyed alumni among home and host countries. Sampling of this stakeholder group was done by the home institution and proved to be quite difficult because of lack of complete alumni records and contact data. 43 out of 58 alumni were currently employed. Out of these 43, 34 were employed by an international/multinational company and 11 worked in countries outside South America, namely Denmark, France, Italy, Norway, Spain and USA. In comparison to the current student data, the distribution among home countries was more diverse. It is difficult to evaluate if the subsample obtained is representative of the entire population of double degree alumni.

Regarding employment, a majority got employed within a month after graduation and, after a few years, saw themselves as in low or middle management positions. They work in research and development, IT, production, administration and business planning.

Within the ADDE SALEM project, a few open seminars with invited representatives of alumni and employers were arranged in South America (São Paulo and Santiago) before the surveys were distributed. At those seminars it became clear that the concept of double degrees is not widely known among South American companies hiring engineers. In order to avoid obtaining very ambiguous data, it was decided to restrict the survey to companies with a specific interest in the engineers graduated from the partner universities. In Chile and Brazil, employers present at annual job fairs were approached, while the responses from Argentina and Colombia were obtained from companies in the significant networks that the HEIs have with companies. Table 5.3 shows the distribution of surveyed companies by country.

5.3 STATISTICAL METHODS

For some question items in the survey, respondents in different stakeholder groups were asked to answer by providing a ranking on a five level scale, such as from Extremely high [importance] to Not at all [important]. Such data lend themselves to statistical analysis in terms of checking if one set of such data, provided by one stakeholder group, is statistically different from a corresponding set provided by another stakeholder group. To test if two such sets represent equal, continuous distributions with equal medians the non-parametric method Mann-Whitney U-test was used. Formally, a null-hypothesis was formulated, i.e. it was tested if we could reject that the data sets were equal. If the null-hypothesis could be rejected it was concluded that they were different with a specified degree of certainty. If the significance level in such a test is set to 0.1 (*p=0.1*), it means that the conclusion drawn is correct with 90% certainty. Unless otherwise specified, the significance level used in this study was *p=0.05*.

As the test is based on ranking of discrete data, responses can be assigned any numerical value, such as 1-5, without obscuring the statistical properties or conclusions. Thus there is no inherent assumption regarding the "spacing" between the different responses. This is in contrast to analyses were merely mean values and standard deviations of sets of discrete numerical values are compared.

5.4 RESULTS - MOTIVATION

This section consisted of three questions, all of which were common for current students and alumni.

5.4.1 Why students do double degrees

The first and second questions both for students and for alumni were "What motivates/motivated you to do a Double Degree?" and "Where do you expect/see the greatest impact of your Double Degree?" respectively. Note that the phrasing was slightly adjusted to be relevant to the different groups, according to the

principles layed out in Table 5.5. Each question had the same seven predefined answering options and one open alternative. Typically, students and alumni checked two to three answering options.

The main results are shown in Table 5.6. It is striking that students and alumni ranked the same options top-three regarding pre- and post-experience factors. For both students and alumni, the highest ranked answering option was *Personal development*.

While 46% of the students put *Better career option* as a motivation factor, an even higher fraction of these students, 56%, expect *Better career options* while they do their double degree abroad. The expectations thus increases somewhat as they are away to study at the host institution.

However, the experiences of the alumni regarding better career options is less favorable; a significantly (*p=0.0017*) higher fraction of the alumni are motivated by *Better career options* than the fraction of alumni that actually see this materialize.
Given that the structure and opportunities on the labor market could be expected to differ between countries, the alumni were further divided into Brazilian (*n*=27) and non-Brazilians (*n*=31). It turned out that only 22% of the Brazilian double degree holders had experienced better career options due to their double degree, as compared to 56% of the non-Brazilian. There is a highly significant difference (*p=0.009*) between the two groups. Hence, most of the difference between the motivation of the alumni and the experiences of the same cohort can be explained by the fact that the Brazilian alumni do not see any better career options due to the double degree..

Just after this group of three motivation factors, both students and alumni put *Knowledge of new technologies, techniques or methods*. While this factor is indicated by well over 30% of students, this number drops significantly (*p<0.02*) to well below 20% after the studies.

5.4.2 Attitude towards Europe

Question three of the survey was phrased "How has your attitude towards Europe and the European Union changed due to your Double Diploma experience in Europe?". This question was included as the aim of the ERASMUS MUNDUS Action 3 programme, under which ADDE SALEM was funded, is to "promote European higher education through measures enhancing the attractiveness of Europe as an educational destination and a centre of excellence at world level." (see **http://eacea.ec.europa.eu/erasmus_mundus/programme/action3_en.php**)

The answer option items are shown in Table 5.7, together with distribution of answers. For both groups, about three quarters have a much more or slightly more positive attitude. However, a statistical analysis revealed that during and after the double degree studies in Europe, the attitude has become significantly (*p=0.0045*) more positive.

5.5 RESULTS – LANGUAGE SKILLS

Students were asked two questions regarding language skills "Please rate your language skills before you started your DD studies" and "Please rate your expected language skills after you finish your DD studies". The answer option items were English, the relevant native languages (French, Italian, Portuguese, Spanish) as well as three globally important languages (German, Japanese, Mandarin). Answers were given on a five grade scale from No skill to Extremely high skill. Alumni and employers were asked corresponding questions, more directed towards the demands of professional life.

5.5.1 English proficiency improvement

The double degree experience is likely to increase the English proficiency, albeit the studies in Europe are not done in a native English speaking country. As shown in Table 5.8, while a majority of students rated their English proficiency as *high* even before they started their studies in Europe, the student population as a whole,

expect a shift towards higher skills. These expectation of improvement, assessed by comparing skills before and expected skills after the double degree experience, are highly significant (*p=0.00003*). On an individual level, a majority of the students (58 %, *n=66*) expected their English to improve, while a few (8 %) expected his/her skill to get worse.

Table 5.8 also shows that 81 % of the alumni express that English language skills are extremely important for their work, and many alumni indicate just slightly lower importance. Indeed, over 75 % of the alumni indicated improvement on one of the three highest options, that ranged from Extremely high improvement to No improvement. This outcome is in line with the expectations of the students. From the data we could not, however, assess the perceived actual proficiency level after the double degree studies. Discriminating by country, the median of the degree of improvement was slightly lower for studies in France (*mean=3.2, n=39*) than in Italy (*mean=3.5, n=18*) but that difference could not be verified statistically (*p=0.3*).

Table 5.8 also shows how employers rate English proficiency. The survey shows that just as alumni, 90 % of the employers selected one of the two answer options indicating highest importance of English. Although it could be shown statistically (*p=0.103*) that employers see English as less important for work than alumni do, both stakeholder groups nevertheless rate this skill as very valuable.

5.5.2 Other language improvements at the host university

With only one exception, a Peruvian student doing a double degree in Spain, all other alumni (*n*=58) had studied in a country with another native language (French, Italian) than their own mother tongue (Portuguese, Spanish). Out of these, 89% stated that their proficiency in that foreign language had undergone extremely high improvement due to the double degree experience.

Regarding other languages such as Mandarin and Japanese, a few students indicate some improvement, but this is not found across the group as a whole.

5.5.3 Language for professional life

As mentioned above, alumni were asked the question "Please select which language(s) an engineer with a Master degree in your company etc. must know."

The answers were divided according to the home country of the alumni in question. As Table 5.9 shows, among alumni of Brazilian origin (*n=27*) the native language is significantly (*p=0.012*) less important for their work as compared to alumni from Argentina, Chile, Colombia and Peru (*n=31*). A striking result is that almost one quarter of the alumni from Spanish speaking countries assigned no importance to their own native language.
For comparison, the corresponding answers regarding the importance of English is included in Table 5.9. Here, English is obviously very important for the alumni surveyed. However, while Brazilian alumni assign equal importance to Portuguese and English, alumni from Spanish speaking countries see English as more important than Spanish. This difference was highly significant (*p=0.00014*).

5.6 RESULTS - CAREER AND EMPLOYABILITY

As mentioned above, one rationale for students to engage in double degree programmes is to improve their career prospects. One key aspect of a double degree programme is the extra time a student has to invest. Within existing double degree agreements among the ADDE SALEM partner institutions, the students typically prolong their studies by a full academic year, i.e. two semesters of study.

5.6.1 Duration of double degree programmes

In the survey, students and alumni were asked "How much longer can a student prolong his/her education in order to earn a double master degree without negatively affecting his/her employability?" The results,

after answers such as "It doesn't affect negatively independently of the duration" had been taken out, are found in Table 5.10. The two stakeholder groups gave, from a statistical point of view, very similar answers. Their average extra acceptable study time, from an employability point of view, was 2.2-2.3 (+/- approx. 1.05) extra semesters.

Employers accepted on average1.8 (+/- 1.1) extra semesters. The distribution of answers from the employers can be distinguished from the ones of students and alumni on a significance level of *p=0.03*, meaning that it is significant that employers accept less extra study time. However, the mean values are close and the distributions overlap considerably. Hence it is safe to say that the three stakeholder groups agree on about 2 semesters as being acceptable.

5.6.2 Internships

Both students and alumni were also asked about internships in Europe. Students were asked "Would you appreciate an internship at a company in Europe?", Alumni were asked, "Would an employer be more likely to employ and compensate a graduate with Master in Engineering (or equivalent national degree) if he/she had done an internship at a company in Europe?"

The answers were very clear; all but two students (*66 out of n=68*) and all the alumni (*n=58*) responded positively. Asked why, typical students' voices were "Different business perspective and broad experience when back to Chile" and "To put in practice the gained knowledge; to know the EU labor market and to gain an access to job market" Asked about compensation, alumni typically responded " It's important to have this kind of experience abroad and to work in a multinational company" and "When you do an internship at a company in Europe, you have to deal with other cultures, behaviors, laws, norms, rules, etc. This is not the same in your home country."

The employers were asked "Would you be more likely to employ and compensate someone with a Master in

Engineering (or equivalent national degree) if he/she had done an *internship at a company in Europe?"* In this group (*n*=54), 78 % responded "Yes" while 22 % "No". Typically a "Yes" would be justified with "Because of the experience and knowledge in other markets" or " International experience". A "No" came along with comments such as "People are compensated for their deliveries".

Overall, the attitude towards internships is positive.

5.6.3 Risks associated with double degrees

The third question dealing with career and employability was "How do you perceive the risk to employability of a double degree Master graduate who spent the last 1-2 years in Europe before returning to look for work in the home country?" The data in Table 5.11 show that the three stakeholder groups favor the alternative with low perceived risk. However, as a group, the students assign significantly lower risk level than alumni and employers (*p=0.007-0.008*).

The answers of the alumni and the employers could not be statistically discriminated from each other. In fact, it is 80% the probability that these groups agree on the risk by double degrees to employability.

Since the answers of the alumni group was less homogeneous, this stakeholder group was divided into Brazilian (*n=31*) and non-Brazilian (*n=28*) alumni. As a group, the Brazilians perceived somewhat a larger risk, a difference that shows some statistical significance (*p=0.077*).

5.6.4 Employer knowledge

The survey also brought up the subject of how much employers know about double degrees. The students and alumni were thus asked "How much do you expect employers in your home country to know about Double Degree programmes?" and "How much does your employer know about Double Degree programmes?", respectively. Table 5.12 indicates that both stakeholder groups expect employers to fall in one group that

have much knowledge, and another group that know little or nothing.

Although there is no significant difference in perception between students and alumni, the latter group answers included several *Nothing*, in line with the free text comment "I've been passing through some interviews here in Brazil and Double Degree programmes are not known at all." Within the alumni group, there was no difference between Brazilian and non-Brazilian alumni.

5.6.5 Factors to highlight

The last questions in this category dealt with "selling points" in a job application situation. They are phrased as "What aspect of the Double Degree studies would you highlight to influence an employer's decision to hire you?" and "What aspect of the Double Degree studies had the most striking influence on the employers' decision to hire you?" The students and alumni could chose from seven pre-defined answers and/or supply their own answer, as seen in Table 5.13. On average the students indicated many more options, 2.1 as compared to 1.4 answers selected by the alumni. Secondly, there were significant (*p=0.0009*) differences in the mix of answers. Both stakeholder groups rank *personal development* and *knowledge of new technologies etcetera* high. But when it comes to *academic quality of the host institution* and *a formal degree from the host institution*, students rate those selling points higher than the alumni do. The groups differ even more when it comes to the value of *established connections and networks* and *new perspectives on Europe*, two factors that alumni assign much less weight. A few students give personal replies, mostly putting forward the ability to adapt and language skills as a programme outcome.

5.7 RESULTS - SKILLS AND COMPETENCIES

In the survey, stakeholders were asked to give responses related to 19 skills and competencies shown in Table 5.4. Each respondent, whether student, alum-

nus or employer could assign a value from 1 (low) to 5 (high) to each skill/competence reflecting the specific aspect indicated in Table 5.4. Given the surveys and that each group rated 19 skills according to two aspects the total data set consists of over 6 400 elements of data, each one on a 1 to 5 scale.

It should be kept in mind that the difference between 1 and 2 may not be perceived the same as between 4 and 5. However, an underlying assumption for the analysis of the data is that the different stakeholder groups on average interpret the scale in the same way.

Evaluation of data was done according to two criteria. One was to compare the two aspects within each stakeholder group, and secondly to contrast the stakeholder groups with each other. For each stakeholder group the mean of values given for each item (skill/competence) was used to rank their relative importance, while the above mentioned Mann-Whitney U-test was used to test if the means were significantly different from each other.

5.7.1 Overview – ranking by different stakeholder groups

In order to "set the scene" we will begin with an overview of how the three stakeholder groups ranked the skills and competencies from 1 to 19. The data are ranking data shown in Table 5.14.

The ranking was done by taking the mean of responses of importance, ranging from 1 (lowest) to 5 (highest), leaving out missing values (no answers). In this way, two separate rankings were formed for each stakeholder group. Beside the ranking itself, Table 5.14 illustrates the statistical significance of the calculated differences in mean values. The superscript given on each ranking number indicates the ranking number from which the mean differs statistically significantly at $p=0.1$. For example " 1^{2} " means that the skill/competence ranked first (1) is ranked significantly different from the skill/competence ranked second (2) and lower, while " 2^{5}" means that the skill/competence ranked

second is ranked significantly different from the skill/competence ranked fifth or lower.

5.7.2 Student survey – differences in curricula

The students were asked "Rate the importance in the education at your home university", as well as "Rate the added value gained by your Double Degree programme". These questions address two skills/competencies.

In both dimensions, the highest ranked skills/competencies – *Analytical thinking and problem solving* and *Work in an international context*, respectively – stand out as being statistically separated from all others. Also, in both dimensions, the top three can be statistically distinguished even among the top five. However, the skills/competencies ranked 10 to 18 are not statistically separated from each other.

It is also clear that the character of the top ranked skills/competencies differ. The top four among expected added values are: *work in an international context, respect for multiculturalism, teamwork and communication skills*. All these deal with interactive aspects. Correspondingly, the top four skills/competencies of importance at the home university represent more personal factors; *advanced knowledge, being autonomous, ability to work under pressure* and *analytical reasoning and problem solving*. Statistically, these two groups are quite distinctly separated ($p=0.15$), and none of the latter is even among the skills/competencies ranked top seven for added value of the double degree programme.

It is also noteworthy that the factor ranked highest in terms of expected added value, *work in an international context*, is ranked by far lowest regarding importance at home university.

5.7.3 Student and alumni survey – added values

The students and alumni were asked almost identical questions, "Rate the added value expected from your Double Degree programme" and "Rate the added value gained by your Double Degree programme", respectively. Thus,the only difference is that while the

students were engaged in their studies at the host institution when they answered, the alumni could look back with some perspectives.

In order to compare these answers in a meaningful way, it was necessary that the students and the alumni use the 1-5 scale in the same way. One could for example suspect that either students or alumni systematically assigned higher values. However, across all skills/competencies, the average of the difference in means between the skills/competencies, as rated by students and alumni, was as low as 0.016 in a 1-5 range. This minute difference can be interpreted as if the two stakeholder groups handled the 1-5 scale in the same way and, consequently, that there was no systematic bias in the comparative analysis.

As it is clear from Table 5.14, the ranking of added-value skills/competencies was very similar during (students) and after (alumni) the double degree experience. When the arrays of responses were compared, students and alumni provided significantly different responses ($p \leq 0.10$), for only two out of 19 skills/competencies. With reference to Table 5.4, these were number 5, *ability to function in business and entrepreneurial contexts within an organization* (perceived higher by the students) and number 15, *being autonomous* (perceived higher by alumni). This also means that with the exception of these two skills/competencies, the ranking of value added shown for students in Table 5.14 is in principle valid for students as well as alumni.

5.7.4 Alumni survey – added values relevance for work

To investigate the relevance of the double degree programme for employability, alumni were asked to rate skills and competencies in the two dimensions "Rate the importance for successful performance of the job" and "Rate the added value by your Double Degree programme."
Table 5.14 shows that all skills/competencies ranked top four in one dimension were ranked, at least, top nine in the other dimension.

Nevertheless, there were significant differences between the importance and the added value. By testing for significant differences in mean values for each dimension, for each skill/competency, we could test if the double degree experience supported what is important for work. In doing so, seven skills/competencies turned out to be significantly ($p \leq 0.1$) rated higher with respect to importance for work than for added value (high/low). On the other hand, three skills/competencies were rated higher with respect to added value than for importance for work (low/high). This is summarized in Table 5.15.
Table 5.15 also includes those skills/competencies that were not statistically different with respect to importance and added value. Thus they fall in the low/low and high/high categories. The skills/competencies related to *communication skills* and *being autonomous* stand out as being important as well as supported by the double degree experience.

5.7.5 Alumni and employer survey – importance for work

Both alumni and employers were asked "Rate the importance for successful performance on the job". The underlying idea was that while alumni have a personal approach to importance of skills and competencies, the employers may have a more general approach.

In this case, the character of the data provided by the two groups had different properties. First, the overall means of data differed. Therefore the data were normalized. Furthermore, the employers did not discriminate within the 1-5 scale as much as the alumni. The data provided were much more "blurred". This means that even for skills/competencies that were ranked similarly, the mean values of the answers could be significantly different.

Table 5.16 shows the result of the comparison. In this case it is questionable if the statistical analysis is very useful. For example, both alumni and employers rank *character traits* as the number 1. Still, the actual values given are statistically different.

The only skills/competencies that the groups agree on to be of low importance refer to skills/competencies related to classic engineering tasks related to research and development.

5.7 DISCUSSION

The data set was useful. There was internal consistency, enough to use statistical methods to clarify differences in opinions within and among stakeholder groups. The data gathered were sufficient to provide a basis for statistical analysis using a non-parametric method.

Students enroll in double degree programmes for a number of reasons. The main is *personal development*, with *better career options* as the second most important driver. However, alumni do not see these improved prospects as clearly. It is important not to over-sell double degree programmes, by giving the impression to students that all doors will be open upon return to the home country. These results are in line with the voices of students participating in focus groups conducted by Culver et. al. (2012). Those students did not primarily put forward job oriented motivation factors, but rather saw their double degree as an opportunity to travel and to immerse in another culture. South American students have high expectations on the unique, technological content of programmes in Europe. These expectations are not actually fulfilled, according to alumni. The gap between the continents appears smaller than the stakeholder groups originally expected, and this gap is likely to diminish even more in the future.

Students and alumni both testify, on a direct question, that their attitudes to Europe have become more positive. Double degree programmes are an effective way to promote Europe and European higher education in South America. This is also consistent with the data showing that *respect for multiculturalism* is one of the most important added values of double degree programmes. These results are in line with the conclu-

sions of Carlson and Widaman (1988), collected at a time when students on exchange were pioneers.

Poor English proficiency remains one of the key competitive weaknesses of Latin America (Education First, 2013). On a general population level, and Argentina excluded, all South American countries fall in the low or very low English proficiency categories. It is therefore encouraging to observe that improved English language skill is a clear but maybe unexpected outcome of double degree studies in Europe. It is also clear that Spanish speaking graduates find themselves in a labor market were English proficiency is essential, in fact often even more important than Spanish. This raises the question if South American universities should not start to offer education in English, although this may require changes in legislation.

All graduates that have done their double degree in a country with another native language different from their own are in practice tri-lingual after completing the double degree programme.

Double degree programmes should safely aim at prolonging the studies by two semesters, typically implying to spend two years at the host university. This ensures that highly rated skills/competencies such as *communication skills* and *autonomy* are developed. Statistically, employers favor less extra time than students and alumni, but in view of the fact that semesters are indivisible, the groups do in practice agree. This conclusion is in agreement with Culver et al. (2012) who observed that 44% of the alumni favor two semesters for a double degree.

A clear majority of 112 respondents among alumni and employers assign little overall risk for employability to participation in double degree programmes. Only 7 out of these 112 see these programmes as quite or highly risky. One could argue that whatever question asked with regards to choices, there would always be some skepticism. The risks involved are small and should be balanced against the long-term benefits. As

expected the current and probably very enthusiastic students have a more unconcerned attitude, seeing virtually no risk. While the students may be somewhat naïve, the data provided by alumni and employers still clearly show that universities have reasons to promote double degrees, or rather, there are no reasons not to promote double degrees from an employability perspective.

When the graduates apply for jobs in South America, it is the personal development and added values of the double degree experience that they should highlight. Some competitive advantages expected by the students, such as networks in Europe, have little impact on their employability. Some additional time may very well be allocated to *internships* in Europe, especially since more than three out of four employers state that such an experience would benefit employability and/or salary.

The students are definitely over-optimistic about the level of knowledge on double degrees that employers in South America have, while alumni have a more realistic view. But trying to inform employers, an immense and heterogeneous group, is a rather difficult task, almost impossible in the short term. It could be more viable to make the students and alumni more conscious about the skills and competencies developed and their relevance to employers.

Regarding the individual skills and competencies, the expected and perceived value added among students and alumni are almost identical. One could have expected that alumni, out of which 74% had employment, had developed other opinion after getting a few years of perspective, but that was not the case. Instead the answers were statistically inseparable for 17 out of 19 skills and competencies brought up in the surveys.

The data indicate that the double degree experience gained is complementary to the engineering programmes the students take at home, in South America. These emphasize elements characteristic

of subject oriented, analytical, individual work on engineering subjects. The added values are associated with generic competencies, including teamworking and communication skills. The immersion and the studies and life at the host country contribute to the personal development. However, the experiences from working in companies during the double degree studies are less than expected, which even further supports the argument that internships embedded in the double degree programme would be beneficial for all stakeholder groups.

The alumni survey points out matches and mismatches of double degree programmes relative to the skills/competencies important for work. Given that the majority of alumni are employed in international or multinational companies, the agreement that communication skills are important as well as the knowledge of languages, shows that the double degree graduates' skills and competencies match the demands of the employers.

Young engineers are employed for many types of jobs, and not restricted to international companies or tasks. The data provided by the alumni provide some ideas for curriculum development. Training of academic skills/competencies such as *analytical reasoning* and *problem solving* and *critical thinking* can be further developed, and is certainly not to be forgotten for students engaged in double degrees. On the other had, it is striking that *experimentation*, *research* and *discovery* are very important at the home universities, but seem less important for alumni and employers. This is not directly linked to double degrees, but points to some miss-match between the interests of the institutions and the demands of the employers.

On a bi-lateral level it would be possible for partner institutions to use the data from these surveys to identify "hanging fruit", i.e. skills and competencies that could be better developed to meet the needs for success in the engineering profession. To include real-world engineering workplace experience as a part of the double degree programme seems essential.

Finally, the picture provided by the employers is not

clear. The data give the impression that almost every skill and competence is of equal importance. One statistical consequence is that their importance turn as being low although their ranking is high, as illustrated in Table 5.16. Possibly this just reflects the diversity among employers. It should not be surprising that current students form a more homogeneous group, while alumni are a bit more diverse and the employers represent a universe of needs and ideas. In future studies, it is clear that the sample size of employers needs to be enlarged if statistically significant differences within the employer community as well as relative to other stakeholder groups are to be detected.

In the Evaluate-E study by Culver et al. (2012) the survey data regarding engineering specific skills and competencies provided by alumni differed significantly from those provided by students and employers. This was, however, caused by the fact that alumni then were asked about their preparation for work, not about the value added by their double degree programme. Nevertheless, the conclusion made by Culver et al (2012) is still valid; the values added can be summarized as "growth, communication skills, and cross-cultural skills and less subject matter or professional knowledge growth".

However, as Culver et al. (2011) point out, separating out double degree effects from the benefits of an international experience that could be otherwise organized is a real difficulty. The improvement in language proficiency, which would be more profound if you stay abroad for a longer time, could be such a benefit. In future studies, it will be interesting to include "regular" exchange students as a point of reference.

In summary, students that engage in double degree studies develop generic skills and competencies that could not be obtained staying at their home institution. But the short-term expectations regarding competitive advantages in the labor market should be realistic. South American universities should put internationalization, as well as teaching in English, high

on the agenda. Universities can safely recommend double degree programmes, but should use objective information such as the data produced within ADDE SALEM to develop the double degree curricula.

South American double degree graduates are great ambassadors for Europe, which is an argument for EU and EU member country governments to invest in promotion and stipends for double degrees in engineering.

5.8 TABLES

Table 5.1: Host and home institution countries of current students surveyed in the study.

Home institution country	Host institution country		Total
	France	Italy	
Argentina	0	1	1
Brazil	41	7	48
Chile	3	1	4
Colombia	1	13	14
Mexico	1		1
Total	46	22	68

Table 5.2: Host and home institution countries of alumni surveyed in the study.

Home institution country	Host institution country			Total
	France	Italy	Spain	
Argentina	4	3		7
Brazil	27			27
Chile	7	4		11
Colombia	1	11		12
Peru			1	1
Total	39	18	1	58

Table 5.3: Country of employers surveyed in the study.

Country	Total
Argentina	2
Brazil	23
Chile	15
Colombia	14
Total	54

Table 5.4. Skills and competencies addressed, in order and wording as they appeared in the surveys.

1	Advanced knowledge on specific subjects and research. (For example: Mathematics, sciences and engineering)
2	Analytical reasoning and problem solving. (Risk analysis, decision-making, simulation methods and tools)
3	Experimentation, research and discovery of new technologies and knowledge.
4	Design, development and management of systems, processes and/or products over their life cycle.
5	Ability to function in business and entrepreneurial contexts within an organization. (Innovation, organizational culture, application of emerging technologies, business plan development, manage finances)
6	Ability to manage external factors within social and environmental contexts. (Knowledge of contemporary issues, sustainable solutions, laws, standards and regulations)
7	Teamwork (Interpersonal skills, work in multidisciplinary teams, value and respect for diversity and multiculturalism)
8	Communication skills (Speaking, writing, and listening skills)
9	Character traits such as integrity, reliability, empathy, ethics.
10	Value and respect for diversity and multiculturalism.

11	Ability to work in an international context. (Including knowledge of foreign languages)
12	Internal drive (Initiative, flexibility, self-motivation, lifelong learning, self-discipline, creativity)
13	Critical thinking (Critical and system thinking, creativity, self-criticism)
14	Ability to concentrate under pressure.
15	Being autonomous.
16	Ability to analyze risks and make decisions with levels of uncertainty.
17	Ability to create or innovate in new businesses or products based on or supported by technology.
18	Ability to appreciate and differentiate the diverse organizational cultures and interact appropriately within it.
19	Ability to verify and validate the performance of systems, products and processes against the established requirements and industry standards. (Cost, safety, sustainability, reliability, maintainability, robustness and quality)

Table 5.5. The dimensions addressed in the surveys for the different stakeholder groups.

Stakeholder group	Dimension 1	Dimension 2
Current students	Rate the IMPORTANCE in the education at your home university	Rate the ADDED VALUE you gain by your Double Degree programme
Alumni	Rate the IMPORTANCE for successful performance on the job	Rate the ADDED VALUE gained by your Double Degree programme
Employers	Rate the IMPORTANCE for successful performance on the job	Rate the SATISFACTION with the level of the employees' qualities in the market today.

Table 5.6. Ranking of motivation factors and programme experience among students and

alumni. The percentage shows the fraction of respondents indicating a certain answer option item.
(*) means that the frequency of a certain response is significantly (*p=0.05*) different from the frequency of the item below unless it also carries a (*).
(°) means a slightly weaker significance (*p=0.06*).

Question	Item	Student ranking	Alumni ranking
What motivates/ motivated you to do a Double Degree programme?	Personal development	1° (62%)	1* (81%)
	Better career options	2 (46%)	2* (70%)
	New connections and networks	3 (34%)	3 (39%)
Where do you expect/see the greatest impact of your Double Degree?	Personal development	1* (57%)	1* (76%)
	Better career options	2* (56%)	3 (41%)
	New connections and networks	3 (34%)	2 (46%)

Table 5.7. Change in attitude towards Europe and EU due to the double degree experience.

Answer option item	Students (n=67)	Alumni (n=58)
Much more positive	21 %	53 %
Slightly more positive	54 %	28 %
Neutral	16 %	12 %
Slightly more negative	9 %	5 %
Much more negative	0 %	2 %

Table 5.8: English language skill issues related to students and alumni.

Answer option		Students		Alumni		Employers
		Skill before DD	Skill expected after DD	Importance for work	Improvement due to DD	Importance for work
Extremely high skill/ improvement	5	20 %	56 %	81 %	17 %	57 %
	4	58 %	35 %	9 %	29 %	33 %
	3	21 %	6 %	5 %	30 %	4 %
	2	0 %	3 %	2 %	14 %	2 %
No skill/ improvement	1	1 %	0 %	3 %	10 %	4 %

Table 5.9: Alumni perception of the importance of different languages for work, divided according to origin of the alumni. Notice that each alumnus contribute 3-4 % to the data.

Answer option		Importance of native language		Importance of English	
		Brazilians (Portuguese)	Others (Spanish)	Brazilians (Portuguese)	Others (Spanish)
Extremely high importance	5	74 %	38 %	78 %	84 %
	4	11 %	23 %	7 %	10 %
	3	0 %	10%	4 %	6 %
	2	4 %	6 %	4 %	0 %
No importance	1	11 %	23 %	7 %	0 %

Table 5.10. Perception by students (*n=62*), alumni (*n=51*) and employers (*n=53*) of what extra study time does not affect employability. As a whole the mean value given by all stakeholder groups is close to 2 semesters.

Answer option	Students	Alumni	Employers
0 semesters	4 %	6 %	15 %
1 semester	12 %	10 %	15 %
2 semesters	51 %	42 %	55 %
3 semesters	25 %	32 %	6 %
4 semesters	8 %	10 %	9 %

Table 5.11. Perception by students (n=68), alumni (n=58) and employers (n=54) of the overall risk for employability to participate in a double degree programme. The data given by alumni and employers are essentially very similar.

Answer option	Students	Alumni	Employers
No risk	75 %	52 %	55 %
Somewhat risky	19 %	33 %	18 %
Neutral	4 %	8 %	17 %
Quite risky	0 %	7 %	4 %
Very risky	2 %	0 %	6 %

Table 5.12. Perception by students (n=68) and alumni (n=55) regarding how much employers at their home country know about double degree programmes.

Answer option	Students	Alumni
Very much	15 %	18 %
Much	28 %	24 %
Little	57 %	36 %
Nothing	0 %	22 %

Table 5.13: Aspects of the Double Degree studies relevant for employers according to students (*n=68*), and actual influence on employment according to alumni (*n=57*). Multiple options were allowed.

Answer option	Students	Alumni
Knowledge of new technologies, techniques or methods	31 %	23 %
Academic quality of the host institutions	35 %	19 %
A formal degree from host institution	25 %	14 %
Personal development	63 %	58 %
Personal situation	4 %	5 %
Established connections and networks	25 %	5 %
New perspectives on Europe	26 %	5 %
Others, please specify	4 %	14 %

Table 5.14. Skills and competencies addressed in the surveys. The ranking was done by taking the mean of responses of importance, ranging from 1 (lowest) to 5 (highest). A number "1" means that that specific skill/competence was ranked first (highest). The superscript given on each ranking number indicates the ranking number from which the mean differs statistically significantly at p=0.1. For example "1^{2}" means that the skill/competence ranked first (1) is ranked significantly different from the skill/competence ranked second (2). Missing values (no answers) were ignored.

Skills and competencies, listed according to the ranking by students' expected added-value	Ranking by students		Ranking by Alumni		Ranking by employers	
	Importance at home university	Expected added value	Importance for work	Percieved added value	Importance for work	Gaps observed today
Work in an international context	19	1^{2}	8^{12}	1^{3}	6^{17}	6^{17}
Respect for multiculturalism	13	2^{5}	11	2^{5}	5^{17}	3^{17}
Teamworking	10^{19}	3^{6}	1^{3}	5^{7}	2^{15}	2^{15}

Communication skills	11[19]	4[9]	2[5]	3[7]	7[19]	8[19]
Internal drive	8[13]	5[10]	3[7]	8[12]	8[19]	11[19]
Appreciate diverse organizational cultures	15	6[11]	15	6[9]	14[19]	12[19]
Function in business and entrepreneurial contexts	18	7[11]	9[18]	11	4[17]	16
Being autonomous	2[5]	8[13]	7[12]	4[7]	9	9
Analytical reasoning and problem solving	4[9]	9[17]	4[4]	7[12]	3[17]	5[17]
Manage external factors	17	10[19]	16	17	19	19
Analyze risks	9[17]	11	12	13	12[19]	10
Advanced knowledge	1[2]	12	13	9[18]	16	7[18]
Validate the performance of systems	5[10]	13	14	18	13[19]	4[17]
Create new businesses or products	16	14	18	19	11[19]	13[19]
Critical thinking	7[11]	15	6[9]	10[19]	15	15
Systems design	14	16	19	15	18	17
Work under pressure	3[6]	17	10[10]	14	10[19]	14[19]
Character traits	12	18	5[5]	16	1[7]	1[7]
Experimentation, research and discovery	6[11]	19	17	12	17	18

Table 5.15. Relations between what alumni perceive as of high importance for work, as well as the perceived added value of the double degree programme. The skills/competencies at the upper left and lower right are statistically separated (p=0.1). The skills/competencies at the lower left and upper right are not so statistically separated, but fall in distinct categories.

	Lower perceived added value	High perceived added value
High importance for work	▪ Teamworking ▪ Internal drive ▪ Analytical reasoning and problem solving ▪ Character traits ▪ Critical thinking ▪ Function in business and entrepreneurial contexts ▪ Concentrate under pressure	▪ Communication skills ▪ Being autonomous
Lower importance for work	▪ Advanced knowledge ▪ Analyze risks ▪ Validate the performance of systems ▪ Manage external factors ▪ Experimentation, research and discovery ▪ Systems design ▪ Create new businesses or products	▪ Ability to work in an international context ▪ Respect for multiculturalism ▪ Appreciate diverse organizational cultures

Table 5.16. Relations between what alumni and employers perceive as with high importance for work. The skills/competencies at the upper left and lower right are statistically separated (p=0.1).

	Relatively low importance according to employers	Relatively high importance according to employers
Relatively high importance according to alumni	▪ Teamworking ▪ Communication skills ▪ Internal drive ▪ Analytical reasoning and problem solving ▪ Character traits ▪ Critical thinking ▪ Being autonomous ▪ Ability to work in an international context ▪ Manage external factors	
Lower importance for work according to alumni	▪ Experimentation, research and discovery ▪ Systems design ▪ Create new businesses or products	▪ Function in business and entrepreneurial contexts ▪ Concentrate under pressure ▪ Respect for multiculturalism ▪ Analyse risks ▪ Advanced knowledge ▪ Validate the performance of systems ▪ Appreciate diverse organizational cultures

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6.

Double Degree Programmes: Alumni Perspective

Gwenaëlle Guillerme
École Centrale Paris, Paris, France

6.1 INTRODUCTION

This study was carried out in the context of the ERASMUS MUNDUS Action 3 – ADDE SALEM project, supported by the European Commission. The findings reported here relate to a small part of a larger European project, which aims at promoting the European Higher Education and enhancing its attractiveness through the improvement of engineering double degree programmes between the European Union and South America. The aim of this part of the project was to investigate alumni' perceptions and expectations of the value that dual degree graduates acquired. It also aimed at identifying possible recommendations to improve current and future double degree programmes.

As a part of the globalization phenomenon of the educational market, the number of double degree pro-

grammes offered has greatly increased over the years. Mobility flows through double degree programmes are influenced by a variety of factors of a complex and multidimensional nature. It is important to notice that both from Europe and more and more from South America, the willingness to study abroad among students should remain strong, supported by the Ministries of Education's internationalization strategy and the high value placed on overseas education. Besides, more and more families can also afford to pay for education abroad. This will sustain important outward flows in the future. Also, more and more double degree programmes are being developed, mainly due to the demand of students, who consider it as a better opportunity compared to the other programmes, in order to benefit from a high quality education, to enhance their language skills and to gain better job opportunities. At last, these programmes are also seen as opportunities for the academic institutions to enhance their visibility on the international education market, also new ways for two institutions to improve and mutually enrich their academic offerings. Thus, by working together, mutual recognition and cooperation is strengthened.

In the literature, we can find studies by authors such as Culver and al. (2011) and Obst and Kuder (2011). They have clearly analyzed elements influencing both students' and faculty members' decision to choose to participate in double degree programmes. However, there is still a lack of understanding on how alumni perceive the impact of their double degree, how it evolved during and after the programme and how these expectations match the companies' objectives.

Thanks to the alumni perspective, it is also possible for institutions to understand the real perceived value of double degree programmes, which is essential in order to identify if there is some misinformation that could be handled. Therefore this study is trying to provide a comprehensive view on the current appreciation of double degree programmes from the alumni experience.

In order to obtain meaningful results a questionnaire has been designed with the purpose of collecting information that would help to further develop double degree programmes and better understand the interpretation behind students' and alumni decision's. The main research question is targeted as follows:

- How do Students and Alumni value double degree programmes?

In addition to the main research question, there are also sub-questions included in this research so that a more comprehensive view of the subject can be achieved:

- Before starting, what were the expected values of the double degree programme?

- How could benefits of double degrees be utilized to communicate more efficiently on this type of programmes with the corporate world?

6.2 METHODOLOGY

The study gathered data from alumni among South American engineers that have completed double degree studies in Europe. A sample of 58 alumni answered to this study. Of the 58 alumni interviewed, 36% indicated they held a job in the industry sector, 16% in research, 31% were either self-employed or working in a consulting firm, and 17% were currently unemployed. Of those with a permanent job, 32% had been in their current position less than 1 year, 35% 1 to 2 years, 33% 2 to 5 years, 20% out of them earned more than 50K €.

Despite the fact that different points were analyzed with the help of quantitative methods, qualitative methods were extremely important. In order to explain the phenomenon as well as possible and get more personal feelings, open-ended questions were used in every questionnaire.

6.2.1 Questionnaires

Questionnaires were the most important data collection techniques that were used in this study. What did Double Diploma Alumni expect from their European Double Degree programme, and how did they fulfill these expectations? Which opportunities for career and personal development did their Double Diploma already offered? Alumni testimonials are essential, because it is their suggestions and contributions that can lead to the programme's decisive improvement. The study included in depth interviews. The respondents were granted anonymity. The survey contains questions regarding career perspectives and the development of skills acquired through the programme, as well as personal and social development. Questionnaires aimed at students and alumni acquired comparable data. The next theme was designed to encourage alumni to compare double degree programmes with other international study options, especially short-term programmes. Finally, the questionnaire focused on revealing alumni' opinions on the development of double degree programmes.

6.2.2 Interviews

More qualitative research technique was used to increase the depth and quality of the study. In other words, the main goal of a phone or face-to-face interviews was to better understand double degree programmes' impacts. A total of twelve former double degree students were interviewed. The aim was to allow double degree alumni to express their opinions and let them introduce their own views about their double degree experience. Also, one of the objectives to perform such interviews was to understand how concrete alumni' expectations towards double degree programmes really were. Due to the small number of respondents, results did not allow us to make generalizations and draw valid conclusions. However, interviews did provide good insights about the matter and double degree programmes' aspects; the results were used to support various statements and outcomes of quantitative surveys.

6.3 ANALYSIS

A key perspective in this study is to understand the relationship between alumni and double degree programmes. Firstly, they are the main stakeholders as they are identified as former users of such programmes. On the top of that, the success of double degrees at the institutional level is based, at least in part, on how attractive students and alumni perceive these programmes. It is very interesting to notice that to the question "What motivated you to do a Double Diploma?" the most selected answer was *personal development*. Other reasons for them to apply for such programmes deal with the opportunity to acquire new skills, to get a new specialization and acquire knowledge that could not be obtained at their home institutions. However, some students, at the time they chose to apply for a double degree programme, were motivated by the fact that it might improve their possibilities for a better career prospective. Real outcomes of double degrees correlate, to some extent, to expectations of students, but there is some discrepancy in it too. Firstly, graduates do not clearly see the positive impact that the double degree had had on their career prospects. Some of them expressed that a few employers misunderstood the concept of what a double degree really was. Thus, there is not clear evidence if the double degree has made them more competitive for jobs. However, it is noteworthy that alumni clearly acknowledge the added value of the programme in terms of the added skills that gave graduates some advantages at work. On the one hand, they acquired competencies in analytical reasoning and problem solving. On the other hand, they developed soft skills in teamworking and communication. Thus, it can be stated that double degree programmes might have an impact on graduates' professional development. This fact has been acknowledged in the literature with Crossman and Clarke suggesting that double degrees "transferable skills include oral communication, high level learning skills, problem solving, decision making, and affective skills and traits such as responsibility, a positive attitude, interpersonal skills and the ability to work both in a team and independently".

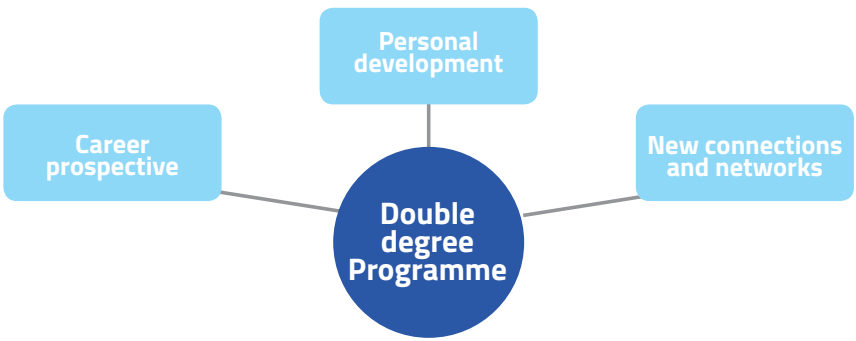
6.4 FINDINGS

This section will outline the results of the questionnaire sent to alumni. The main goal was to collect answers to questions, which were identified in the first section; what is the real added value of double degree programme for alumni? In addition to this, the aim of this section is to identify the issues that double degree programmes ought to perform in order to increase stakeholders' appreciation of the programme values.

As explained in the methodology section, respondents to the questionnaire were categorized depending on their nationality: Brazil, Argentina, Colombia, and Chile.

To complete what was stated previously, it is important to identify the real value of double degrees perceived by the alumni and identify the reasons of such perceptions. At this point, it seems reasonable to study what are the main criteria that guided these former students. Indeed, **many are the factors that students face when they have to select a degree programme.** The analysis of the answers to the questionnaires

Fig.6.1 - Key motivation factors



suggest that several criteria were used in the evaluation process, including international and intercultural objectives. Moreover, many of them are related, in one way or another, to a better international awareness. It can also be stated that these objectives are achieved

through high-quality education and therefore students expect that the host university is able to support also rational objectives.

6.4.1 Career prospective

The literature has been unable to analyze double degrees' impact on improvement of employment opportunities. However, when the alumni were asked to analyze their experiences and openly share their personal expectations, it became clear that better employment opportunities were strongly expected. Based on the quantitative results and in the light of the double degree graduates' interviews, one can say that double degree programmes may accelerate their career development. As one respondent mentioned:

"The double degree programme was of fundamental importance to me from a personal point of view, for professional and international experience, besides internships"

Another respondent continues:

"Today, I am living in China working for a Brazilian company. My double degree gave me the tools to have the right professional approach to start my engineering career".

Secondly, it still remains unclear if double degree graduates have higher salary compared to a person with a single degree or if the increase is due to a more effective career advancement. The issue is also most likely very company-specific and thus analysis of the issue would require collecting more contextual data. In any case, higher wage level seems to be one clear objective for students. As a conclusion, it can be argued that starting salary should not be the main reason to participate in double degree programme, but it might still have an impact on the decision-making process.

6.4.2 Skills and competencies

Thirdly, this study shows that the alumni chose the double degree programme as they expected to com-

bine different specializations in order to get a broader technical expertise. All alumni expected that the knowledge obtained from double degree programmes would be much deeper compared to single degree programmes. It is noteworthy that alumni agree on the fact that this education programme allowed them to acquire much wider knowledge by combining different areas of study and experiencing different viewpoints. These rational attributes could be indicators of higher-quality education. Furthermore, the opportunity to get two specializations is seen as a major advantage.

6.4.3 Language competencies

The alumni agree on the fact that their double degree allowed them to increase their international awareness and their language skills. It can also be deduced that double degree programmes do have an impact on the ability to better develop language competencies compared to other programmes. It became clear that double degree programmes are expected to allow students to gain international experiences more likely than it would be possible by participating in a single degree programme. The double degree had an impact on the development of multicultural skills and helped them to manage unfamiliar situations and change their way of reaction towards unexpected events.

At this point it is valuable to introduce how double degree graduates, would describe the greatest value of the programme. A respondent, mentions:
"Having a Double Diploma as part of my resume helped me a lot to work at a multinational company as I do today. The fact that I lived for two years in another country said enough"

It is also interesting to discuss how alumni rate the most important added value of double degree. They were asked, "What aspect of the Double Degree studies had the most striking influence on the employers' decision to hire you?" The alumni were able to chose from seven pre-defined answers. The *development of intercultural skills* and *personal development* were mentioned. Furthermore, *ability to create networks* and *im-*

provement of language competencies were recognized. Alumni also stated that issues such as *impact on graduate's employability* and *effective combination of different areas of study* are rather well supported by double degree programmes.

Table 6.1 - Sample of alumni' comments.

Alumni expectations of the double degree	▪ Better career options ▪ Better salaries than someone who has only one single degree ▪ Networks ▪ Language competencies ▪ Specific skills (hard skills)
Alumni perceived impact of the double degree	▪ Useful to have broader knowledge ▪ A definite advantage ▪ No career benefits ▪ Might have more success on the long term ▪ May help with getting an interview, thereafter not sure it has direct career benefit, especially in terms of better salary options ▪ Confusion of terms. Some employers misunderstand the concept of double degree. Need to explain what a double degree is during my interview. ▪ International dimension allow to adapt quickly in the international environment of my company ▪ Soft skills (communication, team working, ...) ▪ By choosing double degree programmes, I was not limited to choose only one career path and had the opportunity to discover new opportunities in different fields that could impact my career on the long term

6.5 CONCLUSIONS

Most of the interviewed alumni had a positive experience about the double degree programme. Overall, the findings suggest that they have a greater breadth of knowledge and technical expertise than their single degree counterparts. They gained better communication skills, confidence, increased their international vision and have a different approach to solving problems. As stated previously, it is still difficult to prove that double degrees increased their position on the job market. However, most of them felt that the acquired competencies allow them to have a quicker career progression. Thus, the breadth of knowledge and skills of double graduates may be a good starting point for a successful career.

On the question of whether employers are more likely to employ and compensate a Master in Engineering if the graduate has done an internship at a company in Europe, mixed responses were seen. Some alumni indicated that it made no difference, while others indicated that, all other things being equal, an internship at a company in Europe would be preferred. This is a complex issue which has to take into account individual perceptions of employers that, in turn, depends also on whether the activity of the company is internationally oriented or not. However, no employer indicated that they are not interested in recruiting double graduates.

Thus, the possibility to develop students' own skills and improve their knowledge level seems to be the main value-adding attributes of double degree programmes. Alumni interviewed for the ADDE SALEM project mentioned that they applied to double degree mainly due to rational objectives. Double degree participants were willing to focus on building their career "marketability" by combining two academic backgrounds and to live an extensive international experience. When asked if they would recommend the double degree programme, 98% agreed that they would recommend it to others.

7.

Needs, Expectations and Feedback from Companies regarding Double Degree Programmes

Zoubeir LAFHAJ
École Centrale de Lille, Lille, France

7.1 INTRODUCTION

With the continuous increase of double degree programmes worldwide, companies start to give more attention to the characteristics and the content of the double degree programmes followed by the candidates seeking for a specific Job position. Double degree's characteristics change from one continent to another, sometimes even at universities of the same country. For instance, the period of time spent abroad isn't standardized among all double degree programmes. This parameter, among others, strongly affects the quality of the educational experience and the employability of double graduates as well. This study concerns the analysis of the different parameters that affect the employers' perception of double degree programmes.

7.2 METHODOLOGY

The data for this analysis were collected by a questionnaire survey administered to several companies and by focus groups. Different criteria were used for the selection of participating companies:

1. Geographical criterion: Local, regional and international companies were invited.
2. The company size : The sample contained companies with size ranging from 3~5 to more than 500 employees.
3. Strategic vision: Companies with international vision were invited as well as companies with no intent to expand their business worldwide in the current state.
4. Multidisciplinary: The feedback may change from one company to another depending on their industrial sector (information technology, service, construction ...).

A great number of the surveyed companies were partners of the project. Indeed, it is a difficult task to have their feedbacks on the double graduates they hired as well as on their needs. Moreover, to find the right contact wasn't an easy task: companies are afraid of revealing confidential information about their strategy and their relation with universities. Based on that observation, the first step was to reassure and to inform the companies on how they can benefit from this experience. Several contacts were invited: human resources managers, directors and personal and institutional contacts as well.

How to address the companies?

From the beginning, we were aware of the challenges that come from persuading and involving the companies as well as gaining their trust. In addition to the updated project website, mails were sent to inform the companies about the ADDE SALEM Project's aim. Those mails were clear, specific and short in order to make the companies interested enough to answer our invitation. The second phase consisted of sending mails and e-mails with more information regarding the project. The last phase requested making direct phone calls. Some events organized by our institutions were used to convince the companies to par-

ticipate in the workshops and to answer the survey. The questionnaires were initially sent by mail but this action didn't produce good results. In a second phase they were delivered by hand. Eventually the polls have been filled in by using the internet: this phase was the most productive. Then, the surveys were analysed. Biannual meetings with companies were organized at the partner's home countries, with the presence of all the representatives. The audience was composed of students, professors, academics and companies' representatives and guests. The meetings organized in different partners' countries (Chile, Brazil, Argentina, Colombia and Europe) have broadened the debate. Indeed, a link was established between "Students" and "Alumni" and it was very interesting to see their interaction. We also observed that some double degree students have created their startups. The roundtables were organized with structured agendas and questions circulated in advance. This procedure allowed anticipating the key issues that should be addressed in front of a professional public. The questions had been prepared by our management committee in order to focus on the project's objectives. They also took into account the specificities of the South American job market. This work was carried out by the project's management committee interacting with all the partners both Institutional and Associate. Indeed, the socioeconomic situation differs greatly in Brazil, Argentina, Chile, Colombia and Europe. However, we noticed an unexpected common vision of companies when looking for the perfect employee. Meetings and roundtables were held in an atmosphere characterized by a great openness of all the stakeholders (companies, students, partners), showing their commitment to produce useful results.

7.3 RESULTS AND ANALYSIS

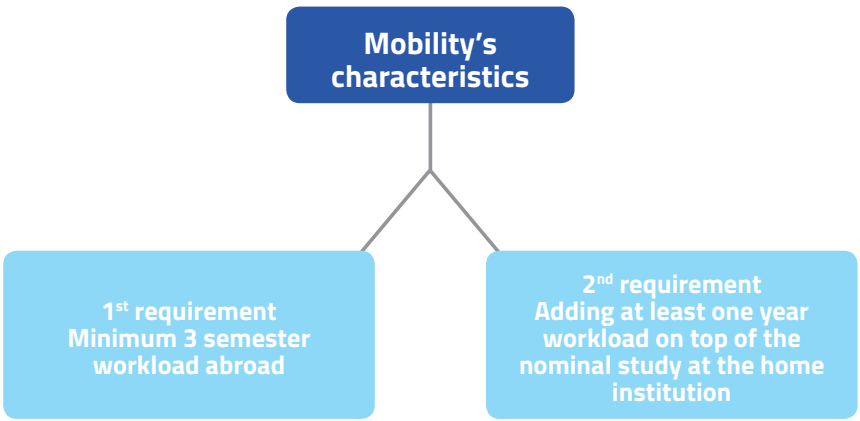
The results are divided into 5 categories related to employers' perspective.

- Double degree and international experience awareness.
- Double degree characteristics.
- Double degree benefits.
- Communication and promotion of double degree programmes.
- Double degree disadvantages according to companies.

7.3.1 Double degree and international experience awareness

This part concerns how companies perceive International mobility that leads to the awarding of a double degree . We mainly considered the structure of double degrees as it is accepted by the T.I.M.E. Association, that is respecting the following requirements.

Fig.7.1: Requirements demanded by the T.I.M.E. Association



Double degree awareness

This first topic concerns the company's knowledge about double degree programmes. It shows the positioning of double degree holders in the recruitment process of the companies surveyed. The companies' answer about the double degree awareness revealed that it depends on the companies' division. Human resources are often aware of what a double degree is. The companies also underlined the increasing awareness of double degree programmes theses.

When we asked students about the University's awareness of double degree programmes, 50% reported that sometimes double degree studies are considered as a vertical mobility. That means that the students must complete one programme in order to start the second one, which is not our case. Often, there is no difference between a double degree student and a normal enrolled student. Finally, the students agreed on the fact that employers generally know what a double degree is (Bi-cultural and Bi-competence holders). However, during the interview process, students need to give more explanation in order to justify their double degree due to the existence of several types of double degree programmes.

International experience awareness

The second part concerned the companies' perception of an international experience. This experience isn't necessarily a double degree experience but it concerns all types of mobility.

When asked this question, the companies gave information about how they perceive employees with international experience. The results were that international employees have more employer-targeted qualities than their peers.

Two questions were asked: "Have you ever met professionals, engineers that have completed their undergraduate or postgraduate degree abroad?" and "Are they different from the ones that completed their degree within their countries?"

Those two questions are specific and target-oriented. Their objective is to compare an International and a National education in order to improve the design of

new international double degrees. Table 7.1 shows the results according to the employers:

Table 7.1: Characteristics of employees according to employers

Employees with international experience	**Employees without international experience**
Different ways of thinking and solving problems	One way of solving problems which is the way of the home country
International work experience	National work experience
Benchmark of advanced technical skills	Technical skills provided by home country to all the graduates
Soft skills: autonomy, independence, self-criticism, openness to other views and perspectives, adaptability and maturity	Soft skills less important than technical skills during the programme
Seek International career and mobility	Seek stability

Employees with international experience are more likely to provide great support to companies also owing to their problem solving capacities. Indeed, the surveyed companies are aware of the critical thinking provided by the international openness compared to local experienced employees. This is the most important and demanded skill by employers. Another point is about technical, soft and hard skills. Soft skills are the key characteristics that make the difference during the recruitment process since all the candidates who graduated from an institution of our consortium already have advanced technical skills.
A particular issue deals with those French companies that even if not yet expanded world wide (only locally), have a vision of expansion since many of their clients are now located abroad. Those firms start to under-

stand the prominent role of double degree graduates in their future strategy. Those companies claim that their recruitment process, so far, included only local employees (neither international employees nor employees with double degree or international experience). The consequences of this type of recruitment process are that it doesn't take into account the companies' strategic view. Indeed, employees now aren't interested in mobility (national and international mobility as well). This may generate serious problems and conflicts within the firm.
The trend now is that firms start to offer specific training for their employees, based on the needs and the quick growth of the market. The training often concerns advanced technical skills that are provided outside the country. It's a huge investment for the company. Double degree programmes are a great deal. The consequence is a shift in the candidate selection toward an international profile.

7.3.2 Double degree characteristics

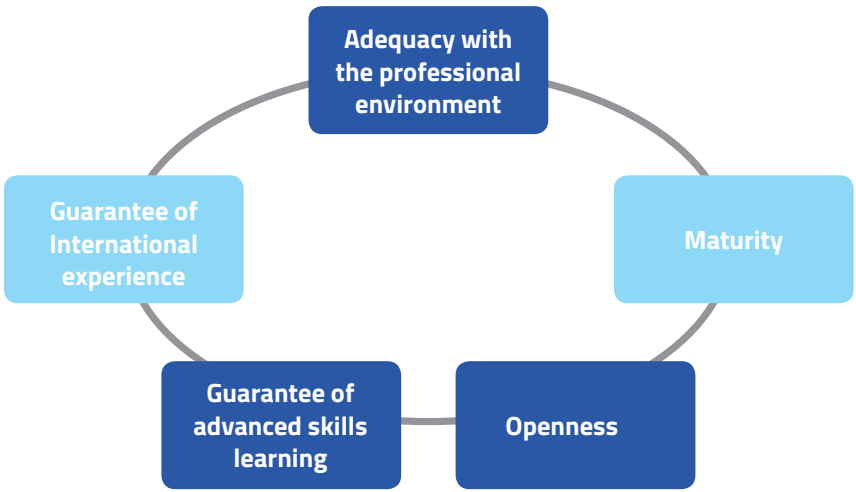
A great number of the companies surveyed stated that their strategic view must be aligned with all the functional aspects within the firm. The recruitment phase must change in order to maximize the chance for a good strategic implementation in the long term. The next survey phase concerned the companies' need and expectations from a double degree programme.
Given the two requirements proposed (see Figure 7.1) we asked the following questions: "What do you think of the first requirement: we don't permit less than 3 semesters abroad?" and "What do you think of the second requirement of adding one year of workload to get two degrees?"
All the companies agreed with the two requirements. The main reason that supports the first requirement is:

- Studying abroad for less than three semesters is too short and frustrating for the student as well. A minimum period of time to adapt and to understand the country's culture is necessary.

On the other hand, Alumni's feedback stated that a period abroad less than 3 semesters long can be ad-

equate for students looking only for specific courses or skills. That may require a shorter period of time. However, Alumni agreed that less than 3 semesters abroad won't provide you with some specific soft skills like openness and capacity to think in a different way.

Fig. 7.2: Employers' perception of the second double degree requirement



Adequacy to the professional environment
Adding a workload, which is described as one additional year in order to get a second degree is in line with of the enterprise system: if an employee looks for more benefits, it is reasonable to get an additional workload. The second requirement is a good deal for students looking for more benefits.

Maturity
Maturity can't be gained without experience. To add one year is perceived as a maturity sign for companies. The student can't understand the culture and a different educational system, and the way of doing business as well, without adding a reasonable period of time.

Openness
This point is much appreciated and sought after by companies because it is closely related to the problem solving skills sought after in the employees. Acquiring different problem solving approaches is the most important quality according to the companies' surveyed and it is not possible to benefit from that without being exposed to other systems (educational and business systems) for a significant period of time.

Guarantee of advanced skills learning
The majority of companies surveyed stated that learning new technical skills without adding an extra workload may be almost impossible. To excel in a specific field requires additional learning time. The student is more reliable and credible if he/she supports the expertise gained with an additional workload.

Guarantee of international experience
Companies are reluctant when confronted with graduates claiming international experience without a minimum of two years abroad. Companies are aware of the characteristics that compose an international experience. Those components concern cultural integration, adaptability and skills appropriation. The second requirement is considered as a guarantee of a completed international experience.
Alumni's perception about the time spent abroad isn't exactly the same. While a short period of time gives the employers the impression that the student didn't accomplish a lot, they claim that adding one year sometimes is not worthy. Some of them think that a double degree programme without a workload could be more interesting and beneficial.
On the other hand the student's point of view is in line with companies' perception. A high quality programme requires a long period of time.

7.3.3. Double degree benefits

Global skills
When asked the question "According to you, what are the benefits of the double degree programme?" the

companies related their benefits to the points established in figure 7.2. They see a double degree as a sign of maturity, cultural openness and developed technical skills in that order. The necessity of different approaches to tackle a problem is stressed as well. Finally, companies now tend to change the way of doing business by Benchmarking. The globalization and the market unpredictability force the companies to acquire new techniques and organizational models. Double degree graduates are more likely to find jobs under those circumstances.
Students were also asked the same question in order to compare the expectations from different stakeholders. Students tend to expect a lot from double degree programmes compared to the other stakeholders. The benefits of the double degree programme are shown in the next table.

Table 7.2: Double degree benefits according to students and alumni

Double degree benefits according to:	
Students	**Alumni**
Build a profile different from that of other students	Build a profile different from that of other students
Discover different ways of teaching	Discover different ways of thinking
Discover other cultures	Networking
Enroll in a specialization that is not available at the home country	
Launch international career	
International openness	

Both students and alumni consider: *Building a profile different from that of other students*.
To clarify this issue, the stakeholders were asked the following question: "Does the fact of holding a Double Degree increase the chances to get a job?"

Table 7.3: Stakeholders view regarding job opportunity increase and double degree programme

Companies view	Students view	Alumni view
It's not the degree itself that gives the opportunity to get a good job: it's more what comes with it (skills, international factors)	A double degree increases the chances to get a Job	A double degree increases the chances to get a Job

The companies relate the chances to get a job to the skills acquired, not to the degree itself. This shows the need of better communication and promotion of double degrees to constituencies external to the world of higher education.
The following part deals with this specific issue.
For alumni and students, the double degree is without doubt a key factor of getting a great job position. An example was given by an Alumnus who was given as the first job a position usually requiring a 7- year experience thanks to the double degree acquired.
As to differences of perception, Alumni tend to focus more on the professional benefits acquired with a double degree programme. Indeed *networking* is mentioned many times. In addition to that, *discovering different way of thinking* includes cultural, educational and professional aspects. On the other hand, Students consider a double degree programme as a journey to discover culture and to excel in studies which can make their profile unique.

Language skills
The stakeholders were asked the following question: "How important is for companies that an engineer speaks several languages?"

Company's point of view
Most of the surveyed companies are trying to reach new markets. Some of them already integrated this

issue in their policy while others plan to do so during the next years. That is why, speaking several languages becomes crucial for their engineers. Many French companies, for example, have strong relations with Asia which requires of their employees fluency in several languages. Companies also claimed that the needs now are different from the ones of some years ago: the change of the strategic point of view requires cultural openness. One company claimed that 60% of its turnover is made outside France. Another one claimed that companies that focus only on the home market find it very difficult to survive. Implementing operations abroad shelters them from internal market crisis. However, some companies do business only in English and don't require other languages. Those companies don't give any credit for speaking several languages.

Communication and promotion of double degree programmes

When asked the question: "What do you think universities should do to promote Double Degree programmes among employers?" all the stakeholders agreed that Universities should target Human Resource Managers.

Multinational companies pointed out the existence of two major problems:

1. Sending people to different countries (like Germany or Italy). Often they have to face the fact that their employees lack language skills as well as cultural openness
2. Creating mobility among different companies around the word.

Institutions should take into account the companies' needs when designing double degree programmes. An example of communication strategy has been developed by the T.I.M.E. Association.

All the European and one of the South American partner Institutions are of the T.I.M.E. Association that launched its *quality label* for double degrees. It is awarded to those double graduates (of two T.I.M.E. member institutions) that complied with the requirements previously mentioned (at least 360 ECTS cred-

its, and at least 3 semesters of workload at the host institution).
We addressed these issue too in our Focus groups.
For the majority of companies, the most important thing is the name of the school, the internships and the acquired experience. A communication campaign has to be done for the quality label in order to give this certificate more value. Organizing Alumni meetings could be a great beginning.
The students suggested a Mentoring procedure. The idea consists, for example, of a foreign company having activities in France that mentors a group of double degree students studying in the Company's home country.

7.3.5 Double degree disadvantage according to companies

Based on the results obtained so far, double degree programmes are very appreciated by the companies since they provide high quality profiles. Double degree students acquire many skills. Some of those skills are very important to companies depending on the specialization. However, many companies don't recruit double degree graduates. The main reason is the high salary expected by double degree holders. A double degree programme is seen as an investment by both Alumni and Students. According to their perspective, this investment should be translated into two major results:

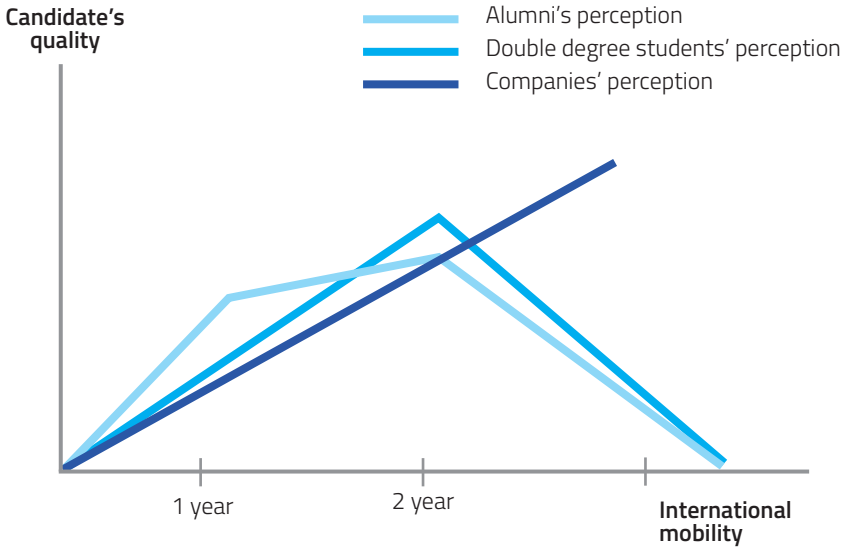
- Relatively higher salary compared to a graduate who followed a one-degree-track programme.
- Challenging job positions with a potential for a quick promotion within the firm.

The companies are aware of that. However, many of them prefer to hire a non double graduate with skills that are tailored to a specific job position. For instance, software development position could look for a computer engineer with a specific knowledge in software development. Teamworking capacity is praised but not essential for this particular position. As a consequence, the candidate isn't obliged to demonstrate high teamworking quality in his CV. The combination of little teamworking experience and high technical skills is sufficient to obtain this position.

7.4 ANALYSIS

All the results converge to say that the majority of employers acknowledge the quality and the adequacy of double degree programmes and the international experience with their actual needs. Double degree experience provides students with tools, techniques and qualities that can't be found in a normal one-degree experience. However, the perception of international mobility is quite different among Employers, Students and Alumni as shown in the figure below.

Fig. 7.3: Qualitative stakeholders' perception of the ideal employee depending on the time spent in international mobility



Companies tend to see international mobility as a guarantee of high quality employees' profile. The more time spent abroad, the more skills acquired. On the other hand, students also see international mobility as a way of distinction, which is a sign of high quality profile. However, spending more than two years abroad can affect the number of years of professional

experience. In addition to that, students tend to overestimate the benefits of the international mobility within their studies. Finally, Alumni acknowledge the importance of a 1-year programme double degree. They claim that sometimes, one year is sufficient to get the full benefit from studying abroad.
The second point concerns the acknowledgment of double degree programmes within companies. Figure 7.3 gives an hint of the optimum information flow for promoting double degree programmes. The results of the study revealed that Human Resources Managers act as a relay of information between universities and the company's entities. A major communication plan for Human Resources must be implemented in order to promote double degree programmes.

7.5 CONCLUSIONS

In essence, this article provides the perception of employers regarding international mobility and in particular double degree programmes. All the companies recognize the importance of double degree programmes in creating the perfect employee. This is due to the experience gained abroad that differs from the home country experience and is often complementary to it. Double degree programmes add some aspect that make the student more qualified and more suitable for all job positions. This point can be explained by the existence of common qualities sought after by all employers when looking for the perfect employee. However, the perception of international exposure changes from one stakeholder to another. Students tend to see international exposure as the key of distinction that will bring several benefits. On the other hand, Alumni also underline the potential of short double degree programmes and international exposure as a means to convey specific and targeted objectives. Finally, Students and Alumni put a limit to the duration of the international exposure past which the benefits start to decrease. On the other hand companies prefer long periods abroad. Indeed, the period of time abroad (2 years or more) won't dramatically change the entry position or the salary. Finally, to increase the aware-

ness of double degree programmes within companies, the suggested way is to start targeting Human Resources departments. Indeed they often are the first ring of the chain of communication between Higher Education Institutions and Companies.

Author note: A particular thank goes to Ricardo Naveiro whose contribution was fundamental. In particular the open conference organized at Rio de Janeiro allowed us to put in focus the needs and expectancies of the Brazilian companies and Alumni.

8.

Double and Joint PhDs

Pascal Bernaud
École Centrale Paris, Paris, France

A questionnaire has been administered to the member Institutions of the ADDE SALEM Consortium in order to compare their PhD systems.
Here, in the different paragraphs, the answers are analysed. When they are country specific the answers themselves are reported.

8.1 ADDE SALEM partners

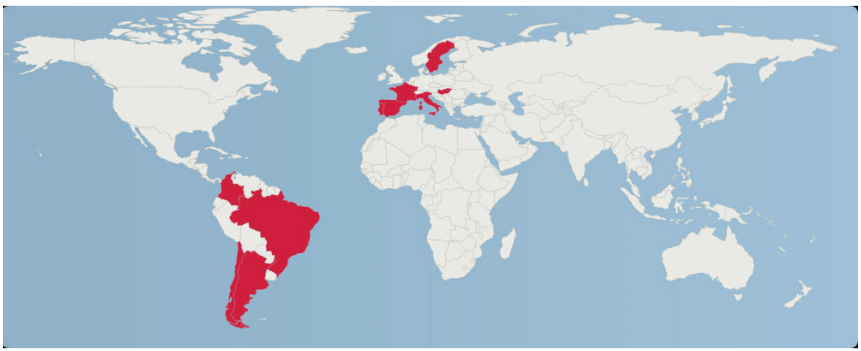
Map view of 16 partners in 6 European and 4 South American countries.
In Europe:

- Politecnico di Milano (Polimi), in Italy
- École Centrale de Lille (ECLi), in France
- École Centrale de Nantes (ECN), in France
- École Centrale Paris (ECP), in France
- Budapest University of Technology and Economics (BME), in Hungary

- Instituto Superior Técnico de Lisboa (IST), in Portugal
- Universidad Politécnica de Madrid (UPM), in Spain
- Lund University (LTH), in Sweden

These universities (or engineering schools in France) are located in 6 member States of the European Union.

In South America:
- Instituto Tecnológico de Buenos Aires (ITBA), in Argentina
- Universidad Austral (Austral), in Argentina
- Universidade Federal do Rio de Janeiro (UFRJ), in Brazil
- Universidade de São Paulo (USP), in Brazil
- Pontificia Universidad Catolica de Chile (PUCC), in Chile
- Universidad Técnica Federico Santa María (UTFSM), in Chile
- Universidad Del Norte (UNINORTE), in Colombia
- Pontificia Universidad Javeriana (PUJ), in Colombia



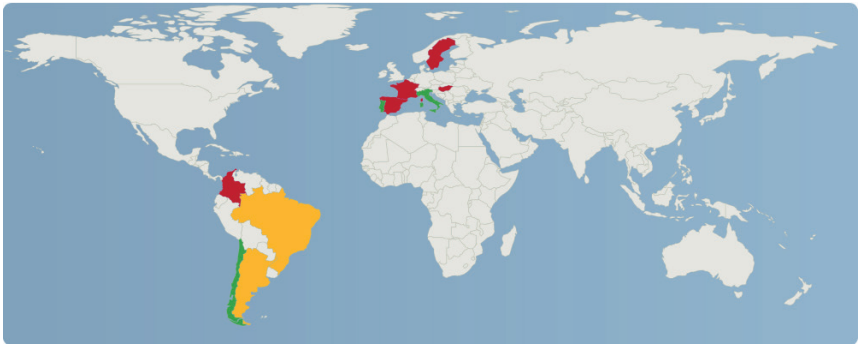
Country of ADDE SALEM member

Differences and similarities concerning PhD in those 10 countries will be presented on 5 general topics:
- Admission to a PhD
  - Process
  - Required level and/or diploma

- Studies during a PhD
  - Credits / courses
  - Duration
  - Academic body responsible
- Joint PhD
  - Legal issues
  - Experience of partners
  - Expectances of partners
- Double PhD
  - Legal issues
  - Experience of partners
  - Expectances of partners
- Defence of the thesis

8.2 Admission to a PhD at ADDE SALEM partners

8.2.1 Selection to a PhD at ADDE SALEM partners



Qualifications / certificates
Qualifications / certificates and interview
Written exam sometimes

In Colombia at PUJ, in Hungary at BME, in Spain at UPM and in France at ECLi, ECN and ECP the selection of a PhD candidate is realised according to qualifications and an interview.
Other skills are also needed. In Colombia at PUJ, for example foreign language with a C1 level in English.
In Spain Doctor degrees are regulated by Royal Decree (R.D. 778/1998, R.D. 99/2011) *Real Decreto.*

In Colombia at UNINORTE to enter a PhD programme the student must meet all the following requirements (see also required level for admission):

- Application for admission, including a research proposal.
- For undergraduate: Saber PRO score (national exam for evaluation of competencies regarding the field of knowledge) greater than 60 points and grade point average of 3.7 or greater in the case of applicants who obtained an undergraduate degree after October 14, 2009.
- Submission of official transcripts.
- Demonstrate proficiency in English (at least B1 level).
- Approval of psychological examination.
- Approval of personal interview.
- 3 academic recommendation letters.

In Sweden, admission to 1st and 2nd cycle is national; admission to the 3rd cycle is done by the university, but usually delegated to the departments (regular admission when the PhD candidate is employed) or at faculty level (when the student receives a scholarship). Therefore, the admission process depends on the faculty. Application documents are sent directly to the faculty including officially certified copies of documents/certificates/transcripts and other supporting documents, as required for the specific position/particular faculty. Authorised translations are often needed.

In Portugal at IST and in Italy at Polimi selective procedure is based mainly on qualifications and research projects.

In Chile, the Graduate Studies Committee performs a review of the background and the grades of the candidate in order to evaluate their possibilities of success.

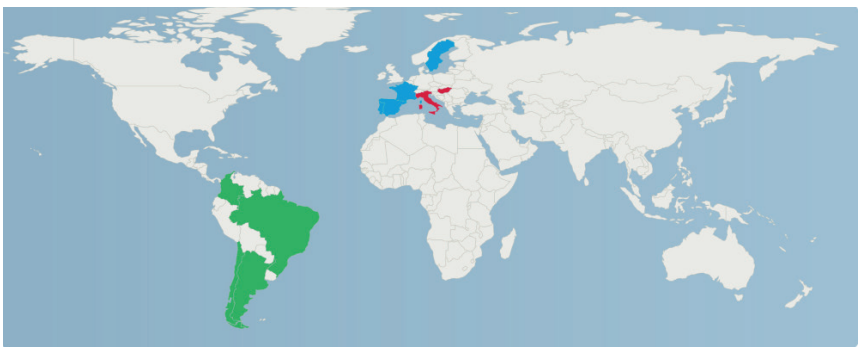
In Brazil at the UFRJ the selection procedure is organised by every faculty and doctoral school and it is common to have an entrance test and CV evaluation. At USP, it depends on the faculty. For example in Indus-

trial biotechnology it is only based on qualifications, in electrical engineering on qualifications and interview, in material science and engineering on qualification, interview, foreign language ability, and a written exam.

In Argentina at Austral, there is no compulsory procedure for admittance; it may be defined but it is not mandatory. At ITBA there is a PhD Commission for admission that interviews the PhD candidates and this admission process includes a written exam.

As an example, for France we refer to ECP. Admission is organised by the Doctoral School on proposal of the supervisor of the thesis subject and through the director of the laboratory where the job will be done. Application documents are compulsory as an interview of the PhD candidate. There is no written exam. No PhD candidate can be accepted if there is no financial support for his/her work: a PhD candidate is a junior researcher in France and work legislation needs to be taken into account. All rules concerning PhD, Doctoral Schools in France are defined in a decree of August 7th, 2006.

8.2.2 Required degree level for PhD candidates at ADDE SALEM partners



Bachelor
Master
Master level – proof without the title

In South America there is no homogenous definition

for degrees as in Europe with Bologna process. Depending on the country and the university itself, a *bachelor* (licienciatura in Spanish speaking countries) may have a 3, 4 up to 6 year duration. The *Master* (maestria in Spanish speaking countries) does not show the same necessity before a PhD depending on the bachelor's duration.

In Colombia at PUJ, a Master (maestria) is not required to enter a PhD but is highly valued. At UNINORTE there is difference between admission for undergraduate and master level candidates: when a master level student is accepted, it is possible to validate all or part of his/her credits (see also credits and courses section).

In Italy at Polimi, the master of science (*laurea magistrale)* is needed; a bachelor is not sufficient to enter a PhD.

In Spain at UPM, a Master degree is not compulsory, but at least 60 of the 300ECTS required have to be at Master level (*Real Decreto 99/2011, de 28 de enero*). In other words, the candidates must be in one of the two following conditions:

- Be in possession of a bachelor's degree obtained at a university in Spain or in a country in the European Higher Education Area (EHEA) that qualifies to be admitted in a Master programme and have passed a minimum of 300 credits in the total of undergraduate and graduate studies of which at least 60 ECTS must correspond to the master level
- Be in possession of a bachelor's degree obtained at a university in a country other than those indicated above. The Spanish university must be satisfied that the level of the studies leading to this degree is equivalent to that of Master degree in Spain and that it qualifies the holder to enrol in a PhD Programme at its country. It is not necessary to obtain official accreditation of a bachelor's degree to be able to register at a doctoral programme in Spain

In Sweden at LTH, to be admitted to doctoral studies, students need to have completed courses for at least 240 credits, of which at least 60 credits must be for Master level studies.
In most cases, students hold a Bachelor's degree and a Master degree, with a major in the same subject as the one of the intended postgraduate study. The major must include a degree thesis presenting the results of independent research. The quality of the thesis is of particular importance and must demonstrate a capacity for independent thinking in this piece of work. Students must have a very good command of English and may be asked to include proof of proficiency in the form of a TOEFL or IELTS test, if requested by the individual department. All PhD positions must be officially announced. Decision to select and to admit is done by the Head of the Department (normally) or by the Dean of the Faculty (if stipends or special agreements are involved).

In Hungary at BME, a Master level degree is a prerequisite to be enrolled in a PhD. A bachelor is not sufficient.

In Portugal at IST it is necessary to hold a Master degree or equivalent degree corresponding to a 5-year programme, or hold an academic, scientific or professional record recognised as particularly relevant, attesting the candidate's ability to attend this cycle of studies.

In Brazil at UFRJ and USP a master (maestrado) is compulsory to join a PhD. There is possibility to be enrolled in a longer « direct PhD » programme with a bachelor (licienciatura or bacharelado).

In Chile the prerequisite is the Licenciatura, bachelor.

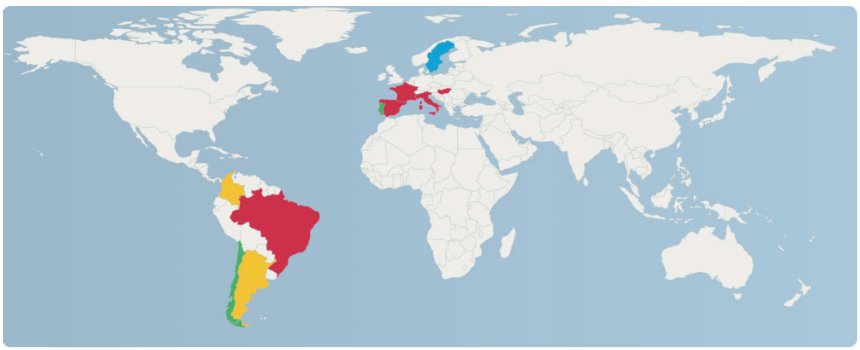
In Argentina law permits enrolling a student with a bachelor and not necessary in a longer programme.

For France we refer to the Écoles Centrale that are member of ADDE SALEM. French or foreign students

who hold a French Master Degree may apply and register for a PhD. Without the French master degree, the candidate (for example with a foreign master degree) needs a special authorization given by the doctoral school showing that he/she has the equivalent level of a French master degree and he/she has a first experience in research.
The Master Degree requirement may be waived in exceptional circumstances where a candidate has already benefited from a recognized introduction to research or has already undertaken a personal research project.
The final decision is taken by the Director of the Doctorate School following the candidate's proposal by the Supervisor.

8.3 Studies during a PhD at ADDE SALEM partners

8.3.1 Credits and Courses during a PhD at ADDE SALEM partners



Around or less than 30 ECTS
Between 30 and 60 ECTS
More than 60 ECTS
No specific rule: from 50 to 120 ECTS

In Colombia at PUJ, no specific coursework is requested during the PhD but the total workload to be allotted

to the classes is about 28 Colombian credits (1 Colombian credit considered as 1 hour of presential class + 2 hours of study out of class, for 16 weeks: 48 hours of work = 1.5 to 2 ECTS) (28 Colombian credits mean between 42 and 56 ECTS). Subjects are not mandatory but maybe agreed upon with the advisor.
At UNINORTE a PhD means 120 credits (Colombian credits) with 72 credits (60%) in classes (see required level section).

In Italy at Polimi coursework is requested for PhD candidates, for about 30 ECTS.

In Hungary at BME no coursework is requested during the PhD. One can obtain a PhD with participation in a 3-year long PhD training (in this case 180 ECTS are required, the proportion of classes depends on the different PhD schools) or without such participation.

In Sweden, a PhD programme encompasses exactly 240 ECTS (4 years of full time studies) with 60 to 80 ECTS of coursework. Compulsory courses, faculty-wide and programme specific, are included in all PhD programmes. Most PhD studies have employment as doctoral students with all social benefits (sick leave, parental leave...) and pension credits. It is possible to combine PhD studies with employment in industry by special agreements. The PhD candidate is regarded as a young researcher more than a student.

In Portugal at IST the PhD is based on an Advanced Study Course with a total of credits from 30 to 60 ECTS, followed by a Research, Development and Innovation (RD&I) work leading to a PhD thesis.

In Spain at UPM 30 ECTS of coursework are requested during the PhD period, unless the Master degree is specially oriented to a specific PhD programme.

In Colombia at PUJ and UNINORTE, and in Italy at Polimi, it is possible to ask the PhD students to follow courses that are assigned to them.

In Brazil at UFRJ the total workload allotted to courses during the PhD is about 30% so that the candidate completes 180 hours during the first year of studies. At USP it depends on the faculty: 25% or 24 ECTS in Electrical engineering, 20% in Industrial biotechnology, 540 hours (36 credits) in classes in Hydraulic sanitation, 30% in Transportation engineering. In Material science and engineering it is more complicated: 450 hours (30 credits) are assigned to students with MSc degree but 18 additional credits are required for «direct PhD» candidates. In either PhD or "direct PhD" 144 credits (2160 hours equivalent) are assigned to thesis work.

In Chile at PUCC, students are admitted to PhD programmes with a Licenciatura, equivalent to a bachelor, so they need additional studies, which are accomplished in approximately one year. It means around 50 ECTS. There is no core of required courses; the student elaborates with his/her adviser a programme of courses, according to the area in which he/she will work for his/her thesis. This programme has to be approved by the Graduate Study Committee.

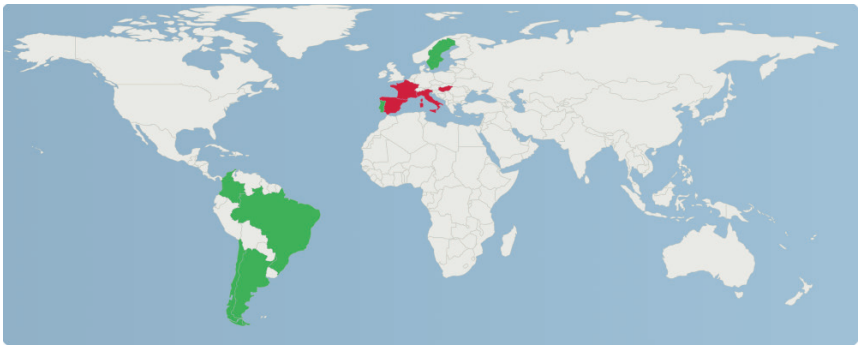
In Argentina at Austral there are some classes required and they are defined by the institution. The curriculum must not be quite structured. At ITBA the average is 40%: there is a requirement of 500 hours of PhD level courses. These courses depend strongly on the adviser.

In France at ECP the PhD candidate must attend 100 hours of lectures provided by the Doctoral School. Those lectures may be:

- Methods and skills for research activities.
- How to manage a research project.
- How to communicate on research results.
- How to innovate, initiate and promote research.
- English lectures.
- Research seminars.
- French lectures for international students.

There is no compulsory course related to the research topic of the PhD candidate. Usually there is no written exam after the end of these courses.

8.3.2 Duration of a PhD at ADDE SALEM partners



Average duration of 3 to 4 years
Average duration of 4 to 4.5 years

In Colombia at PUJ, the duration of a PhD has a minimal value of 3 years. There is no maximal duration but the case is reviewed by a special committee when a student is in his 6th year. The average duration is about 4 years.
At UNINORTE the duration of a PhD has a minimal value of 4 years if the student has been accepted by the "undergraduate route"; this minimal length is 2.5 years for a student of the "master route", because of the validation of credits; the average duration is 4.5 years.

In Italy at Polimi the duration is 3 years by law (with possible extension to 4 years).

In Portugal at IST, the average duration is 4 years with a minimum of 2 and a maximum of 5 years.

In Spain at UPM, the average duration is 4 years with a minimum of 1 and a maximum of 5 years.

In Chile the average duration is 4.5 years with a minimum of 2 and a maximum of 6 years.

In Sweden at LTH, the duration in years in not fixed, but a PhD programme encompasses exactly 240 ECTS

(4 years of full time doctoral studies). In practice it may take longer since students may teach 20% (adds one more year) and/or are in parental leave up for 12 months (per child). It may also take shorter time if the student can endorse credits from other studies (2nd or 3rd cycle). The average duration is about 5 years.

In Hungary at BME, the duration is usually 3 years. A 4th predoctoral year is possible. After the official application for the PhD degree another 2 years are left for the exams and presentation of the thesis. The duration of state financing is 3 years, but the average duration is greater and depends on doctoral schools.

In Brazil at UFRJ there is no minimum number of years but a maximum of 5 years to get a PhD. The average duration is about 4 years. At USP, it depends on the faculty. In Material sciences and engineering the minimum duration is 1.5 years and 2.5 years for a « direct PhD », a maximum duration of 4 years and 5 years for a « direct PhD » with an average duration of 3.5 years. In Transportation and Electrical engineering there is no minimum but a maximum duration of 5 years and an average of 4.5 years (Transportation) and 4 years (Electrical). In Industrial biotechnology a minimum of 2 years, a maximum of 4 years and an average of 4 years.

In Argentina at Austral the ideal duration is 2 to 4 years. The average duration is close to 4 years. In ITBA the required duration is 4 years but there could be exceptions.

In France at ECP, the usual time required for the completion of a PhD is 3 years, but the average duration is close to 3.5 years. The accreditation process of French Doctoral Schools takes into account this average duration that must be close to 3 years.

8.3.3 Academic body in charge of PhD candidates at ADDE SALEM partners

In Colombia at PUJ and UNINORTE, in Portugal at IST and in Spain at UPM, the academic body responsible of the PhD candidates is the same as for the previous cycle.
Every Spanish Doctoral Programme has a coordinator appointed by the Rector. In case of a Joint Degree the agreement among the participating institutions will define the conditions for the appointment of the co-ordinator.

In Chile at PUCC, the admission process is conducted by the Direccion de Posgrado, investigacion e innovacion. The students are admitted in relation to a professor who will be his/her adviser.

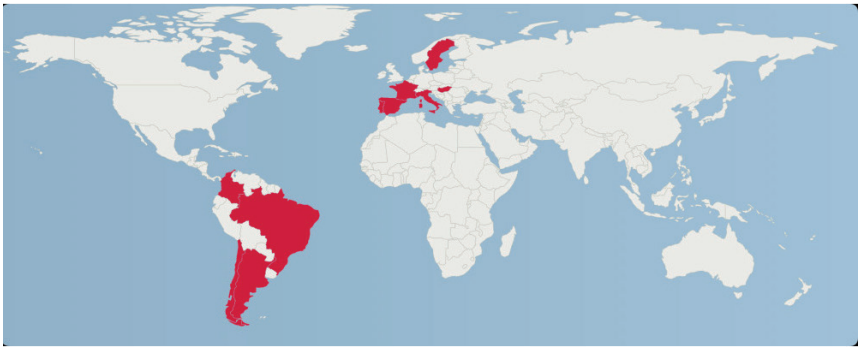
In Argentina at Austral and in Italy at Polimi, the academic body is different from the one of the previous cycle.

In France at Écoles Centrale, in Hungary at BME, in Brazil at UFRJ and USP, PhD studies are organised in Doctoral Schools but these schools are organised with the same academic body as for maestrado (postgraduate studies) but different from bachelor.

In Sweden at LTH they are in Graduate schools, with bodies different from the ones in charge of 1st and 2nd cycle, but with very strong coordination.

8.4 Joint PhD at ADDE SALEM partners

8.4.1 Legal issues for Joint PhD at ADDE SALEM partners



Possibility by law for Joint PhD

Country law allows Joint PhD in Colombia, in Italy, in Sweden, in Hungary, in Portugal, in Spain, in Chile, in Argentina, in France.
Only one organisation can grant the title in Argentina (*Resolucion* 160/11).

The country law in Colombia is a norm established by the Ministry of National Education, decree number 1295 2010 for Qualified Higher Education Academic Programmes regulating the issue of the creation of joint programmes "joint degree" with other institutions. The degree will be awarded by the Colombian university and may include the information of the participating universities. These universities must be legally recognised in their country.

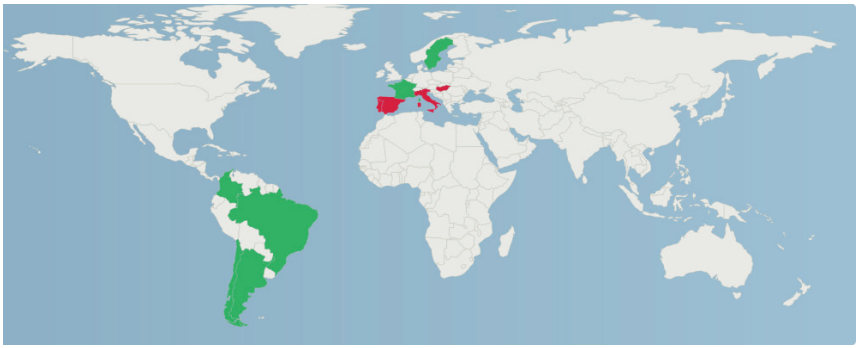
There is no law regarding this issue in Brazil: each university has autonomy to establish a joint PhD.

In France (ECP, ECN, ECLi) Joint and Double PhD are separately defined but have a common basis named Cotutelle and defined through a decree (6 January 2005). This decree gives some rules for both Joint and

DD PhD:

- An agreement may be signed between a French university (or engineering school) and one or several foreign universities to organise the cotutelle: it can be a general agreement with specific ones for every PhD candidate or only specific ones.
- When rules concerning PhD are not compatible between French and the foreign country, waiving of the French ones is possible but it must be specified in the agreement.
- The preparation of the thesis is done by alternating periods according to a programme established in the agreement.
- The principles governing the formation of the jury and the appointment of its chairman are specified in the agreement; the maximum number of jury members is eight people.
- The language in which the thesis is written is specified in the agreement; if this language is not French a summary in French must complete the document.
- The agreement specifies the conditions for enrolment of the doctoral students, tuition fees (the student is not forced to acquit rights simultaneously in several institution) the terms of support for social protection, housing conditions and financial aid.

8.4.2 Experience for Joint PhD at ADDE SALEM partners



No experience of Joint PhD by ADDE SALEM partners
Experience of Joint PhD by ADDE SALEM partners

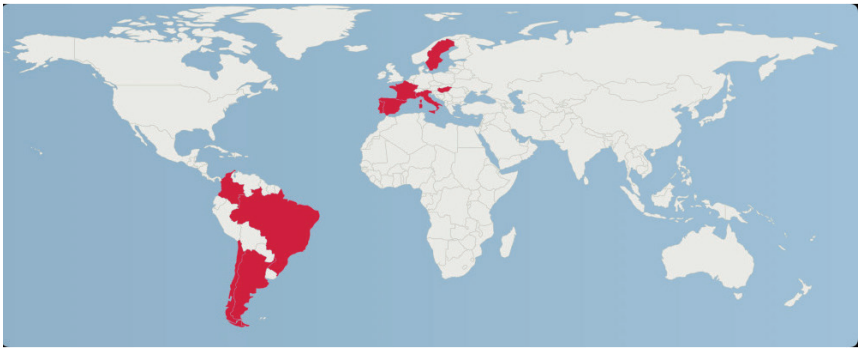
No experience of Joint PhD in Colombia at PUJ, or UNINORTE, in Sweden at LTH, in Brazil at USP, in Chile at PUCC, in Argentina at Austral and ITBA, in France at ECP
Experiences of Joint PhD in Italy at Politecnico di Milano with North America, in Hungary at BME with Asia, Europe and North America, in Portugal with Europe, in Brazil at USP with Europe and North America, in Spain at UPM with Europe (ERASMUS MUNDUS Joint Doctorate).

8.4.3. Expectancies for Joint PhD at ADDE SALEM partners

Developing a Joint PhD is a policy of the universities in Colombia at PUJ, and in Italy at Polimi.
No expectation of Joint PhD at UNINORTE.
Many professors are interested in Joint PhD, but when they understand the complexity they go for cotutelle through DD PhD in Chile at PUCC and France at ECP.
There is some expectation of Joint PhD in Hungary at BME, in Portugal at IST, in Brazil at UFRJ and USP, in Spain at UPM, in Argentina at Austral with ADDE SALEM partners.

8.5 Double Degree PhD at ADDE SALEM partners

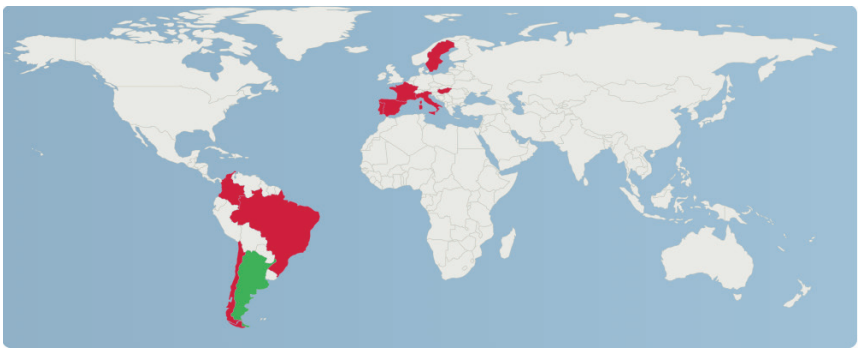
8.5.1 Legal issues for DD PhD at ADDE SALEM partners



Possibility by law for DD PhD

Law allows DD PhD in all the ten countries of the partners of ADDE SALEM project.

8.5.2 Experience for DD PhD at ADDE SALEM partners



No experience of DD PhD by ADDE SALEM partners
Experience of DD PhD by ADDE SALEM partners

PUJ in Colombia has already experienced a DD PhD with an European partner.
UNINORTE has already experienced a DD PhD with a North American partner.
In Italy, Polimi has already experienced DD PhDs with partners in Asia, Europe, Latin America and North America.
In Sweden, LTH has experienced DD PhDs, on a case-by-case basis, with European partners.
Experiences of DD PhDs in Hungary at BME with Asia, Europe and North America.
In Portugal, IST has experienced DD PhDs with Europe and South America.
In Brazil, UFRJ has experienced DD PhDs with France (ECP for instance), and USP has experienced with Europe.
In Spain, UPM has experienced DD PhDs with Europe.
In Chile, PUCC has experienced DD PhDs with Asia, Europe and North America.
No experience of double PhDs in Argentina at Austral.

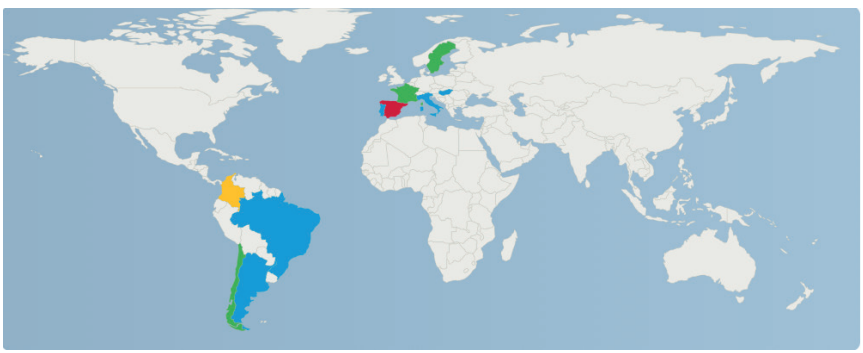
8.5.3 Expectations for DD PhD at ADDE SALEM partners

There are expectations of implementing DD PhD at all the Institutions of ADDE SALEM with the exception of Spain (UPM) where the university policy is Joint PhD oriented.
As an example of the data we collected, in table 8.1 we give the expectations of UNINORTE with the subject areas of PhDs and the relevant European Institutions. This kind of tables will be very useful in organizing meetings of professors to negotiate future agreements.

Table 8.1: Specific expectations: the example of UNINORTE

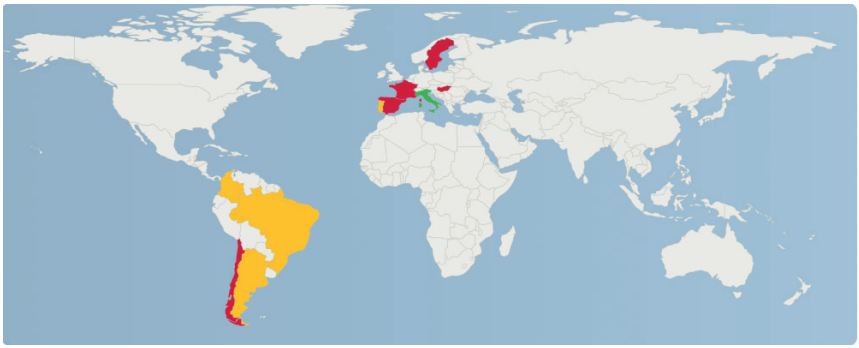
		PhD in Civil Engineering		PhD in Industrial Engineering		PhD in Mechanical Engineering		PhD in System Engineering	
		Joint Degree	Double Degree	Joint Degree	Double Degree	Joint Degree	Double Degree	Joint Degree	Double Degree
France	École Centrale de Lille				X				
	École Centrale de Nantes		X		X				
	École Centrale Paris								X
Hungary	Budapest University of Technology and Economics								X
Italy	Politecnico di Milano		X		X		X		X
Portugal	Instituto Superior Técnico de Lisboa								
Spain	Universidad Politécnica de Madrid		X				X		
Sweden	Lund University		X						X

8.6 Compared expectancies concerning Joint or DD PhD



Expectancies for Joint PhD, none for DD PhD
Expectancies for both but better for DD PhD
Same expectancies for Joint or DD PhD
Depends on the ADDE SALEM partner in the country

8.7 PhD Viva at ADDE SALEM partners



1 single defence for Joint PhD 2 for DD PhD
1 single defence for DD or Joint PhD
No general rules

According to different country laws, the defence of the PhD thesis (Viva) must be done one or several times for a Joint and/or DD PhD.

In Colombia at PUJ, the same thesis work may be used and defended at another institution. Some requirements about language or the documents are not officially defined but could be adapted within the programme.
At UNINORTE two different theses are required for two degrees. There is an institutional Regulation of Students, in the section on professional practices, case studies, theses or dissertations, research papers that mentions in paragraph 118: "It is for each academic division the responsibility to establish the rules governing each category of degree papers, monographs, research papers or thesis, according to the specifications of each academic programme".
"Given the experience in the creation of the double degree with Virginia Tech for the PhD in Mechanical Engineering, it is recommended that separate theses are handled, but which may be complementary, since in each university the student must present original products. It is therefore important that in each double degree agreement, the parties specify very clearly what will be required for students to meet the standards regarding the thesis".

In Sweden at LTH, the same thesis may be used for a DD or Joint PhD. Unless there is justification such as cotutelle, the decision making board would not allow a candidate to recycle scientific papers. The thesis includes a synthesising summary. A minimum of 4 peer-reviewed papers are requested. The questioning is led by an international independent academic expert in the field.

In Hungary at BME, in Portugal at IST, in Spain at UPM and in Italy at Polimi the same thesis may be used for a DD or Joint PhD.

In Brazil at UFRJ thesis must be defended in any institution and written in any language.
At USP the same PhD work may be used for a joint or DD PhD in Transportation, Electrical engineering and Industrial biotechnology but two different theses are required in Material sciences and engineering.

In Chile at PUCC the candidate writes only one thesis and the place and way in which to proceed is determined by the internal regulations of both institutions.

In Argentina the procedure is not defined.

In France the doctoral school supervises the authorization to the final oral defence of PhD thesis and checks the qualification of PhD supervisor.

9.

International Seminars to Achieve a Common Vision: First Circuit

Gabriela Robiolo
Universidad Austral, Buenos Aires, Argentina

I. Introduction

In our search to improve the offer of joint and double degrees in engineering, both in Europe and South America, a group of universities that participated in the ADDE SALEM project, decided to hold seminars that would deepen the relationships among them and foster the possibility of working together.
Two groups worked on that. This chapter focuses on one of them,–which consists of Universidad Austral (Argentina), Universidade de São Paulo (Brazil), Universidad Federico Santa Maria (Chile), Pontificia Universidad Javeriana (Colombia), Politecnico di Milano (Italy), Instituto Superior Técnico (Portugal), Universidad Politécnica de Madrid (Spain) and École Centrale Paris (France).
In May 2014, professors from these four South American universities visited the four European universities above mentioned. A seminar was held at each of the four European countries. This activity gave the attendants the opportunity to collect and analyse data from the different schemes used to define the double and joint degrees offered by the universities that participated in the seminars. In fact, all the seminars were very valuable because there was high integration between the host and visiting universities. Stronger relationships among them were developed, and the participants had the chance to get in touch with people that are key to design and improve their double and joint degree curricula. Actually, the participants are professors that have already designed curricula, are in condition to innovate or create new ones, or they are the people that make the decisions about them.
The interaction of faculty members from the South American and European universities in an European context at the end of the project gave the participants deeper understanding of the similitudes and differences of each university, as well as of the legal frameworks in force in each country. The synergy emerging from the seminars helped the participants to fulfil the objectives of the project: to design Joint and Double Degree Programmes that are more suit-

able for South American students, and to recruit the best candidates for such degrees.
The previous work of the Working Groups on Innovative Curricula at each European institution (with the participation of some South American partners via teleconferencing) made the European participants more aware of the needs of South American students, of their challenges and of the opportunities that relationships create. Also, the opportunity to visit the above mentioned European universities and the interaction with local people made the relationship between the European and South American partners stronger.
As regards the development status of these joint and double degree programmes, it became clear that their progress has been quite different: some of them are mature, so there is strong experience in their implementation, others are just starting, and some have not been born yet, but the universities have the commitment to design and develop them.
Given this fact, the interests and the present circumstances of each of these European universities led them to organize seminars which focused on different topics. At the Politecnico di Milano, the main focus was placed on the integration of the Italian working group with the international one, at the Instituto Superior Técnico, it was the clarification of the differences and opportunities that the South American universities offer, in Madrid, the Spanish and South American educational laws that restrict or limit the programmes of Double Degree design were deeply analysed, and at École Centrale Paris, the opportunities that the new master project of this university will offer were evaluated.
This chapter will first describe the methodology applied in the seminars, the participants, and the particular agenda of each venue, and it will end with the analysis of the key points, the description of the outcomes and the conclusions.

II. Methodology

The seminars were designed to achieve:

a. A detailed study of the different schemes employed by the international programmes of each South American and European university so that a clear catalogue may be written.
b. Clarification of the needs of South American students in order to design curricula that may be particularly attractive for them.
c. Innovation of both the curricula of Joint Degree programmes offered by the European institutions, as well as of those to be developed in collaboration with their South American partners.

The seminars were characterized by the "working together" synergy: the European and South American institutions presented the characteristics of their Double and Joint degree programmes, their history, present status and areas of interest for the development of future projects. The "open discussion time" that followed the presentations was a great opportunity to exchange points of view and to generate new ideas. Finally, rich information about the Joint and Double degree programmes, and about the particularities of each South American educational system, was documented and collected in order to disseminate it in the future.

III. Group 1: Background, Description, Members, Methodology

In this section the four seminars are described, focusing on the particular characteristics of each one, the list of participants and the agenda in each city.

A. Politecnico di Milano (Milan, Italy)

This seminar was characterized by the integration of the Italian working group with the South American universities. The Italian working group is made up by four professors from the Politecnico di Milano, who are in charge of proposing innovations to the faculty, so that the European institution may offer tailor made curricula to cater for the needs of its South American partners. The integration and open discussion with their South American partners was an opportunity to clarify their doubts and check on their conclusions.
On the first day, these two groups worked together in order to obtain a common vision. On the second day, the discussion was open to other professors from the Politecnico di Milano. Professors in charge of double master programmes participated in the morning sessions and professors involved in PhD programmes attended the afternoon sessions. The meetings were also attended by a project officer of the Education, Audio-visual and Culture Executive Agency of the European Commission.

1. Agenda

5th May 2014
Morning: Master of Science Programmes
Afternoon: PhD programmes

- Presentation of data analysis and reflections from representatives of consortium partner universities.
- Discussion, summary of the main points/reflections.
- Preparation of the presentation for the May 6th meeting.

Working group at Politecnico di Milano: Franco Bernelli (Aerospace Engineering), Stefano Bregni (Telecommunication Engineering), Gabriele Masera (Building Engineering), Luigi Zanzi (Civil Engineering), Giuliano Simonelli (Industrial Design), Barbara Pernici (Head of the Doctoral School).
International Working group: Alessandra Castillo (Universidad Técnica Federico Santa Maria – Chile), Gabriela Robiolo (Universidad Austral – Argentina), Andrés Ladino (Pontificia Universidad Javeriana Bogota – Colombia), Fernando Fonseca (Universidade de Sao Paulo – Brazil).

6th May 2014
Morning: Master of Science Programmes
- Presentation of the project and of the analysis of the results to the professors in charge of double degrees in the various study courses at Politecnico di Milano.
- Open Discussion.

Afternoon: PhD Programmes
- Presentation of the project and of the analysis to the PhD coordinators at Politecnico di Milano.

2. Seminar participants

European Members
Politecnico di Milano: Giancarlo Spinelli (Project coordinator), Franco Bernelli (Aerospace Engineering), Stefano Bregni (Telecommunication Engineering), Gabriele Masera (Building Engineering), Luigi Zanzi (Civil Engineering), Giuliano Simonelli (Industrial Design), Barbara Pernici (Doctoral School), Aberto Berizzi (Department of Energy), Bianca Maria Colosino (Department of Mechanical Engineering)
European Commission: Lucia Giannini (Project officer of the Education, Audio-visual and Culture Executive Agency)

South American Members
Alessandra Castillo (Universidad Técnica Federico Santa Maria – Chile), Andrés Ladino (Pontificia Universidad Javeriana Bogota – Colombia), Fernando Fonse-

ca (Universidade de Sao Paulo – Brazil) and Gabriela Robiolo (Universidad Austral – Argentina).

B. Instituto Superior Técnico (Lisbon, Portugal)

This seminar was characterized by a deep analysis of the differences and opportunities that the South American universities offer in order to improve the implementation of Double and Joint degree programmes at Master and PhD levels. The participants mainly worked on the comparison of recognition of studies, mobility time, ECTS and credits, and restrictions that each South American university has. The results obtained by the participants were shared with other people who are in charge of Master and PhD Programmes at the home institution. Also, some students were interested in South American academic opportunities.

1. Agenda

8th May 2014

- Short presentation by IST and LA partner Universities on Internationalization Strategy.
- Double Degrees experience and questions.
- Short tour and presentation of Tagus Campus.
- Discussion on MSc programme structure, DD issues (recognition, mobility time, ECTS and credits, etc...).

9th May 2014

- Discussion on PhD programme structure, DD issues (recognition, mobility time, ECTS and credits, etc..) – hands-on Session.
- Wrap-up session, proposals to improve the implementation of DD at PhD and MSc levels between Portuguese and LA universities.
- Public presentation of the results.

2. Seminar participants

European Members
Instituto Superior Técnico (Lisbon): Ana Pipio (International Affairs) , María de Fátima Montemor (International Relationships), Arlindo L. Olivera (President), José Santos-Victor (Vice-President for International Affairs), Silvia Santos (Office Manager), Luis Olivera e Silva (President of the Scientific Board), Luis Almeida Moreira (Strategy and Planning).

South American Members
Alessandra Castillo (Universidad Técnica Federico Santa Maria – Chile), Andrés Ladino (Pontificia Universidad Javeriana Bogota – Colombia), Fernando Fonseca (Universidade de Sao Paulo – Brazil) and Gabriela Robiolo (Universidad Austral – Argentina).

C. Universidad Politécnica de Madrid (Madrid, Spain)

This seminar focused on Double Degrees, as the educational legal limitations in Spain and the South American countries make the implementation of Joint Degrees difficult. The extensive participation of professors and managers of academic programmes, who interacted with their South American partners, was an opportunity to develop new contacts and future projects.

1. Agenda

12th May 2014
Opening Session
- Welcome: Prof. Narciso Garcia Santos, Vice-Rector UPM. Introduction to ADDE SALEM: Prof. Angel Alvarez, Assoc. Vice-Rector, UPM. Attendants' self-presentation.

Session on Double Master Programmes
- ADDE SALEM Findings on Double Master Pro-

grammes, Ms. Dolores Ajates.
- UPM Experience on DD Master Programmes in LA and China, Prof. Carlos Zanuy.
- Other UPM's Experience on DD Master Programmes, Prof. Juan de Juanes.
- UPM Regulation on DD Master Programmes, Prof. Francisco J. Elorza.
- Structure of Studies and DDs in Brazil, Prof. Fernando Fonseca, USP.
- Structure of Studies and DDs in Chile, Ms. Alessandra Castillo, USM.
- Structure of Studies and DDs in Argentina, Ms. Gabriela Robiolo, Univ. Austral.
- Structure of Studies and DDs in Colombia, Mr. Andres Ladino, Univ. Javeriana.

Summary of morning session on DD Master Programmes and discussion

13th May 2014

Session on Double PhD Programmes
- ADDE SALEM Findings on Double PhD Programmes, Ms. Dolores Ajates.
- UPM Experience on DD PhD Programmes, Prof. Carlos Zanuy.
- UPM Regulation on DD PhD, Prof. Francisco J. Elorza.
- Structure of PhD Studies and DDs in Brazil, Prof. Fernando Fonseca, USP.
- Structure of PhD Studies and DDs in Chile, Ms. Alessandra Castillo, USM.
- Structure of PhD Studies and DDs in Argentina, Ms. Gabriela Robiolo, Univ. Austral.
- Structure of PhD Studies and DDs in Colombia, Mr. Andres Ladino, Univ. Javeriana.

Summary of morning session on PhD DDs and discussion.

Seminar participants

European Members

Universidad Politécnica de Madrid: Garcia Santos (Vice-Rector UPM), Angel Alvarez (Assoc. Vice-Rector), Ms. Dolores Ajates (International Relationships),

Francisco Javier Elorza Tenreiro (Academic Planning and Doctorate), Pilar Manzano (Engineering in Information Technology), Oscar García (ETSI), Marinela García (School of IT), Isabel Carrillo Ramiro (ETS Engineering and Industrial Design), Xavier Ferré Grau (School of IT), Narciso García (GTI), Carlos Zanuy (Civil Engineering / Roads), Juan de Juanes (ETSII).

South American Member
Alessandra Castillo (Universidad Técnica Federico Santa Maria – Chile), Andrés Ladino (Pontificia Universidad Javeriana Bogota – Colombia), Fernando Fonseca (Universidade de Sao Paulo – Brazil) and Gabriela Robiolo (Universidad Austral – Argentina).

D. École Centrale Paris (Paris, France)

The feature of the French educational system at this School of Engineering was analysed and compared with the South American graduate educational system. It is important to note that École Centrale Paris is one of the institutions participating in the new University Paris-Saclay project. The new campus, which is the greatest development project in Paris at present, will have large research infrastructure and associated cutting edge technologies. This project defines a context where double degrees or joint programmes will find an extraordinary environment to be developed.

1. Agenda

15th May 2014
- Introduction by M. Cripps Christopher, Dean of International Affairs.
- Dr. Cagnol John, Director of the Engineering. Programme – École Centrale Paris Engineering Programme: Specificities and rules.
- Fondation de Cooperation Scientifique (Campus Paris-Saclay): Dr. Caristan Yves, Director of International Relations for University Paris-Saclay project - Master of Research in University Paris-Saclay.
- École Central Paris: Dr. Bernaud Pascal, Professor

of Master in Nuclear Energy- Master of Research.
- Pontificia Universidad Javeriana (Colombia): Dr. Ladino Andrés, Department of Electronic.
- Universidade de São Paulo (Brazil): Engineering studies in South America and differences between Master/Maestria/ Maestrado. Dr. Fonseca Fernando, Professor, Department of Electronic Systems.
- Universidad Austral (Argentina): Dr. Robiolo Gabriela, Professor, Computer Engineering Department.
- Universidad Federico Santa Maria, (Chile), Ms. Castillo Alessandra, Coordinator of the International Affairs.
- École Centrale Paris: Ms. Martineau-Huynh Catherine, Deputy Dean of International Affairs- Mobility schemes at Master level, example with PUC in Santiago and USP in Brazil.
- École Centrale Paris: M. Zolver Marc, Deputy Dean of International Affairs – Erasmus +.
- Working Group session on Double Degree programmes.

16th May 2014

Round- table conference

- École Centrale Paris: Dr. Gicque Olivier, Head of Research Center - Research in Centrale – Supélec.
- Fondation Campus Paris-Saclay: Dr. Husson-Bonin Martine, Deputy Dean of International Affairs - PhD in University Paris Saclay.
- École Centrale Paris: Dr. Faÿ Gilles, Deputy Director of Interface Doctoral School - Interface Doctoral School.
- École Centrale Paris: M. Zolver Marc, Deputy Dean of International Affairs - H2020 programme.
- École Centrale Paris: Dr. Bernaud Pascal, Professor in École Centrale Paris, Department of Physics –
- Presentation LIA Brazil.
- École Centrale Paris: Dr. Bernaud Pascal, Professor in École Centrale Paris, Department of Physics - PhD map in different countries (Maps and Comments).
- Round table (Discussion).

Seminar participants

European Members
École Centrale Paris: M. Cripps Christopher (International Affairs), Dr. Cagnol John (Engineering. Programme), Dr. Bernaud Pascal (Nuclear Energy), Ms. Martineau-Huynh Catherine (International Affairs-Mobility), M. Zolver Marc (International Affairs), Dr. Faÿ Gilles (Doctoral School).
Fondation de Cooperation Scientifique (Campus Paris-Saclay): Caristan Yves (International Relations), Dr. Gicquel Olivier (Research Center), Dr. Hussin-Bonin Martine (International Affairs).
Supélec: Raul de Lacerda (Brazil Cooperation).

South American Members
Alessandra Castillo (Universidad Técnica Federico Santa Maria – Chile), Andrés Ladino (Pontificia Universidad Javeriana Bogota – Colombia), Fernando Fonseca (Universidade de Sao Paulo – Brazil) and Gabriela Robiolo (Universidad Austral – Argentina).

IV. Analysis

The analysis of the seminars is performed by describing the key points which arose in each one and the outcomes of such seminar work. Finally, conclusions will be drawn.

1. Key points

Every seminar dealt with different aspects, so they proved to be completely different. In the following paragraphs, the key points of each seminar will be described.

Politecnico di Milano
The seminar was an opportunity for the Politecnico di Milano group and the international group to work together. The students' survey had been analysed by the two working groups within the Politecnico di Milano. The survey was made up of thirteen questions which were answered by forty six French and twenty two

Italian students. The conclusions about the students' answers are:

- They give a greater emphasis to what contributes to their personal development and careers and less to the new knowledge obtained and the academic quality of the host institution.
- They appreciate the additional workload.
- They expect employers at their home country to have little knowledge about Double Degree programmes.
- They consider that professional skills give greater added value to them (e.g. working in an international context, communication skills).
- They think that Double Degrees are communicated correctly to them.

The deep understanding of the students' perspective was considered very important, as the new curricula to be designed should satisfy the students' expectations.

Instituto Superior Técnico (Lisbon)

Differences were observed between the Master and PhD regulations in the South American countries and Portugal. However, despite the differences, there seems to be no obstacle for the development of new double degree agreements. Among the countries in South America there is a variety of situations: from countries with strict regulation (Brazil), to countries with loose regulation (Argentina). In general, all the universities that participated in this seminar are experienced in structuring joint degree programmes. The only exception is Universidad Austral, which is very much interested in developing them. In point 2, the result of this comparison is shown in detail.

Universidad Politécnica de Madrid

Two aspects should be highlighted about the seminar in Madrid: the restrictions that emerge from the Spanish Education law and the high development that Escuela Superior Técnica de Ingenieros Industriales has achieved in double degree programmes.

The government and the Ministry of Education, Culture and Sports of Spain published a new law (PhD.

Real Decreto 99/2011, de 28 de enero), setting the official doctoral regulation framework for Spain. This new framework has several points that do not facilitate the development of new Double Degree programmes, so several Spanish institutions are studying possible modifications. These modifications will affect the regulations of joint direction of theses: the signature of official degrees, the composition of the thesis committees, the thesis submittance process and the selection of the students. In general terms, a more flexible system is needed. Similar work is being done about the official master's regulations.The Universidad Politécnica of Madrid has the most important Engineering College (Escuela Superior Técnica de Ingenieros Industriales – ETSII-) in the country because of the big number of applicants, its educational quality and research development. It has ABET Accreditation and forty three double degree programmes. This College has great experience in double degree programmes that may be duplicated in other areas of the same institution or by their South American partners.

École Centrale Paris

The École Centrale Paris is now involved in an important change process, as it will soon become part of a new university, University Paris-Saclay. In fact, this is a consortium of nineteen HEIs (ecoles, institutes, laboratories and companies), which will be located in Paris. This new university is the greatest project which is being developed in Paris at present. This merge will make it become one of the best universities in the world.

The University Paris-Saclay, which will have a research and innovation orientation, will federate its nineteen members through a common strategy for education, research and innovation in the premises of the new campus. The University Paris-Saclay governance will involve all members, each one keeping its identity, specific diploma and human resources.

The main characteristics are:

a. A single doctoral diploma of University Paris-Saclay.
b. A single chart for Master Diploma of University

Paris-Saclay.
c. A single identifier for the scientific publications.
d. A welcome office for international applicants.
e. An entry point for companies.

The principal objectives of this university are:

a. Develop young talents: both students and professors.
b. Increase partnerships with the industry
c. Attract young students to science.

Another aspect to be pointed out is the fact that each Centrale student will « go international » for at least one semester, during the course of his curriculum, which shows evidence of their great interest in internship, in two ways: receiving foreign students and sending their students abroad. As it is not so common for Europeans to be interested in studying engineering in South America, this particular circumstance opens many possibilities.

2. Outcomes

The outcomes described in this chapter are preliminary steps that will facilitate the development of the new curricula of joint and double degree and the improvement of the current curricula. Also, they will be helpful to find the best students to be enrolled in these programmes.

Improvements in the design of curricula

The analysis of the findings of the survey has shown that:

- What students get from the double degree programmes they attend matches their expectations.
- There is not a clear picture regarding the risk perceived by employers and students when the latter enrol in double degree programmes, but the students seem to be optimistic about the challenge of a double degree.
- The definition of the extra study time as two semesters is appropriate.
- When defining a preferred continent, the country and the macro-economic situation are relevant.
- The skills and competencies acquired by the stu-

dents very well match the employers' expectations.
- Very often, employers do not exactly know what a double degree is, but they emphasize their interest in particular skills and they ask us to find the way to measure them.

Based on these results, we have developed a set of suggestions to improve the design of new curricula or of the ones that already exist:
- More effective communication of double degrees is needed, especially to reach employers.
- The differences between double degrees and "normal" international mobility should be shown.
- The skills of the double degree graduates should be shown to employers.
- Also in Europe employers' needs should be surveyed.
- Matching the employers' needs with existing double degrees is an important task.

Joint PhD Programmes oriented to the industry

During the seminar, the participants from the Politecnico di Milano realized there is a great opportunity to develop a Joint PhD Programme oriented to the industry in collaboration with South American countries. This idea came from the close relationship that the South American universities have with the Italo-American company called Techint.

Techint is an Italian-Argentine conglomerate multinational company founded in Milan in September 1945 by Italian industrialist Agostino Rocca, with headquarters in Italy and Buenos Aires (Argentina). Techint comprises more than 100 companies operating worldwide in the following areas of business: Engineering & Construction, Steel, Mining, Oil & Gas, Industrial Plants, and Healthcare. Techint, with its subsidiaries, is the largest steel making company in South America, (fifth in the Americas). Techint is the world's largest manufacturer of seamless steel tubes, mainly used in the oil industry. This company has a strong relationship with the universities oriented to engineering in the countries where it is working, and it is operating in all the South American countries that participate in this project.

The principal idea held by the seminar participants is that the research topics have to be defined by the industry and then the research itself may be developed in the industry or in an academic context. The thesis resulting from such research may be co-directed by people from the industry and from universities in order to fulfil the objectives of the industry and the academic institutions.

Framework to define new programmes with UPM

ETSII-UPM has forty three double degree agreements, which evidences a long experience in this topic. It has differences in the implementations of Double Degree Master Programmes. Table 9.1 shows different implementations of the Double degree at ETSII-UPM and Table 9.2 a Master programme of specialization which has a professional orientation and its duration is only one year.

Table 9.1: Double Degree at Master level at ETSII-UPM

	École Centrale	French School	After Completing Spanish Bachelor (option A)	After Completing Spanish Bachelor (option B)
Mobility Scheme	4 Sem at ETSII-UPM 4 Sem at EC 4 Sem at ETSII-UPM	6 Sem at ETSII-UPM 4 Sem at France School 2 Sem at ETSII-UPM	8 Sem at ETSII-UPM 3 Sem at Foreign institution 2 Sem at ETSII-UPM	8 Sem at ETSII-UPM 2 Sem at ETSII-UPM 3 Sem at Foreign institution

Table 9.2: Double Degree Master Programme of Specialization at ETSII-UPM

	Masters of Specialization
Mobility Scheme (Foreign Students)	8 Sem at Home 2 Sem at ETSII-UPM

Comparison of curricula characteristics of the South American and Portuguese programmes

The following Tables compare the characteristics of the curricula at the South American universities with the characteristics of the Double Degree Programmes at Master and PhD levels in Portugal, considering the general information, conditions agreed upon, thesis and students selection characteristics. Table 9.3 shows general information about the Double Degree Programmes at Master level, Table 9.4 shows the conditions agreed upon for Double Degree at Master level, Table 9.5 the general Common Conditions agreed upon for Double Degree at Master level, Table 9.6 General information about PhD Double Degrees, Table 9.7 the Thesis Defence in Double Degree PhD Programmes, Table 9.8 the Admission / Workload of Double Degree PhD Programmes and Table 9.9 the Tuition Fees of Double Degree PhD Programmes.

Table 9.3 shows that in South America the first cycle takes from five to six years, contrary to Portugal, where the Bachelor Degree only takes three years. In Chile, Argentina and Colombia students obtain an Engineering Degree in that time and in Brazil a "Licenciatura" degree. The Master programmes take the same time in all the countries and the PhD programmes vary from two to four years. Portugal and Brazil have the same teaching language, which is Portuguese, and the other South American countries have the Spanish language. It is important to note that in Portugal they also use English as a teaching language.

Table 9.3: General information about Double Degree Programmes at Master level

	Brazil	Chile	Argentina	Colombia	Portugal
1st cycle	5 years (Licenciatura)	5 to 6 years (Eng. Degree)	5 years (Eng. Degree)	5 years (Eng. Degree)	3 years (Barchelor)
2nd cycle	2 years (MSc)	2 years (MSc)	2 years (MSc)	2 years (MSc)	2 years (MSc)
3rd cycle	3 years (PhD)	4 years (PhD)	2 years (min) 4 years (avr)	2 years (min) 4 years (avr)	2 years (min) 4 years (avr)
Language	PT	SP	SP	SP	PT/EN (MSc and PhD)

The language requirements for Double Degree at master level are quite different in each country, as shown in Table 9.4. The mobility scheme for Portuguese students is similar to that in Brazil, Argentina and Colombia; only Chile requires four semesters in Chile. Brazil is the only country where it is mandatory to do the defence in this country. The degrees awarded are: Master Degree in Portugal, Engineering Degree in Brazil, Chile and Colombia, which, in the case of Argentina and Colombia, gives professional qualification. Chile is the only country in the South American group that gives a Master Degree.

Table 9.4: Conditions agreed on for Double Degree Programmes at Master level

	Brazil	Chile	Argentina	Colombia	Portugal
Language Requirements	No require-ments	SP Inter. (no need for certifi-cate)	SP B1 level (no need for certificate)	SP Inter. (no need for certifi-cate)	Profiency in EN
Mobility Scheme (PT Studens)	1 Sem at PT +3 Sem at BR +1 Sem at PT	1 Sem at PT +4 Sem at CH +1 Sem at PT	1 Sem at PT +3 Sem at AR +1 Sem at PT	1 Sem at PT +3 Sem at CO +1 Sem at PT	
	Defense at PT	1 Defense	1 Defense	1 Defense	
Mobility Scheme (LA Studens)	7 Sem at BR +3 Sem at PT +1 Sem at BR	7 Sem at CH +4 Sem at PT +1 Sem at CH	7 Sem at AR +3 Sem at PT +1 Sem at AR	7 Sem at CO +3 Sem at PT +1 Sem at CO	
	Defense at BR	1 Defense	1 Defense	1 Defense	
Degree Awarded	PT - MSc BR - Eng. Degree	PT - MSc CH - MSc	PT - MSc AR - Eng. Degree (Profes-sional)	PT - MSc CO - Eng. Degree (Profes-sional)	

All the universities agreed on certain aspects of the double degree master level programme: the characteristics of the selection procedure, the tuition fees, mobility, diploma and the learning agreement.

Table 9.5: Common Conditions agreed on Double Degree Programmes at Master level

	Brazil	Chile	Argentina	Colombia	Portugal
Selection Procedures	Home and Host criteria are applied separately.				
Tuition fees	Paid at Home Instituition (based on balanced mobility)				
Mobility	Balanced between incoming and outgoing				
Diploma	Diploma/Final Certificate only issued after confirmation that the student concluded the Degree at both institutions				
Learning Agreement	Agreed student by student				

Regarding PhD Double Degree Programmes, all the universities agree that four years is the average duration. The minimum number of years varies from country to country, as shown in Table 9.6. At the same time, all the universities accept the thesis to be written in English and the country language. Chile also accepts Portuguese as a thesis language. The duration of the stay at the home institution is quite different: Argentina has no restrictions, in Brazil it is mandatory for foreign students to spend at least one year and a half in such country, in Chile and Colombia, their students have to spend at least 2 years at their home institution and in Portugal students have to spend at least one year at the home institution or fifty percent of the time in each country.

Table 9.6: General information about PhD Double Degrees (time given in years)

	Brazil	Chile	Argentina	Colombia	Portugal
Average	4	4	4	4	4
Minimum	3 (Max. 5)	4	3	3	2
Thesis Language	EN/PT	EN/SP/PT	EN/SP	EN/SP	EN/PT
Duration at the Host Institution	1½	At least 2	N/A	At least 2	At least 1 or 50%-50%

The characteristics of the thesis defence in Double Degree PhD programmes is described in detail in Table 9.7. There are many differences in the characteristics of the defence committee and in the requisites to defend a thesis in each of these countries.

Table 9.7: Thesis Defence in Double Degree PhD Programmes

	Brazil	Chile	Argentina	Colombia	Portugal
	5+2 ▪ Supervisor (No Vote) ▪ 2 Externals	2+2+1 ▪ 2 UFSM ▪ 1 IST ▪ 1 External	3 ▪ 1 External ▪ Supervisor (No Vote)	5 ▪ Supervisor (No Vote) ▪ Committee agreed with both institutions	At IST or abroad. Videoconference restriction when abroad
Defense Committee	▪ 2 Defence ▪ Videoconference allowed ▪ PT students can defend at Portugal or Brazil ▪ BR students should defend in Brazil	▪ 1 Defence ▪ No information about videoconference ▪ Grade 85% on the presentation ▪ Home or Host (No information)	▪ 1 Defence ▪ Videoconference allowed ▪ Grade to be defined in agreement	▪ 1 Defence ▪ Videoconference allowed ▪ Students could defend in both institutions (Colombia preferred)	▪ 1 Defence ▪ Videoconference allowed only at IST ▪ Students could defend in both institutions
Requirements	Minimum - 1 paper accepted in International Journal	Publications can be discussed. Midterm Exam (After courses completion)	Common Publications	Competencies exam (Written exam) Candidate exam (Oral presentation)	CAT (Comissão de Acomphanhamento de Tese) Assess performance

Table 9.8 describes the courses that have to be attended by the students, the admission process and the language required to be accepted. Finally, Table 9.9 describes the tuition fees and other costs that the students have to pay.

Table 9.8: Admission / Workload of Double Degree PhD Programmes

	Brazil	Chile	Argentina	Colombia	Portugal
Courses	▪ 3 courses ▪ 24 ECTS ▪ Teaching is not allowed inside USP.	▪ UCSs 120 ECTS +120 Thesis ▪ With MSc is reduced. ▪ Teaching is allowed	Set by University: ▪ Research plan ▪ Courses can be personalised ▪ Teaching is allowed	▪ Courses are mandatory ▪ With MSc. is reduced. ▪ Research plan ▪ Teaching is allowed	▪ Min 30-60 ECTS ▪ Research plan ▪ Teaching is allowed
Admission	CV Interview	CV Under revision for each case.	CV No restrictions.	CV Interview	CV Interview (optional in some cases)
Language Admission	EN/B1 TOFEL 60%	Not required, but some programmes may established requirements	No restrictions.	EN-B2	Home university certifies student level

Table 9.9: Tuition Fees of Double Degree PhD Programmes

	Brazil	Chile	Argentina	Colombia	Portugal
Tutition Fee	No Fee	Balanced flows	Free	Balanced flows	3000€
	Students can pay at IST, not USP. No diploma No Thesis cost	Balanced flows 1000 USD No Thesis cost	Extra costs to be defined Depend on needs of student. No Thesis cost	No extra cost. No Thesis cost	Balanced flows 200€ (IST only requires in case Defense is local)

This detailed comparison provides a very good basis to begin to develop the new curricula, as it summarizes all the topics that have to be included in an agreement. It was done to compare conditions in Portugal to those in South America, but it is possible to reuse this information to develop other European curricula.

Characteristics of Double Degree Programmes at École Centrale

École Centrale shared with the participants two examples of double degree programmes to foster new agreements, which are summarized in Table 9.10. The first one is the scheme defined with the Pontificia Universidad Catolica (PUC) in Chile and the second one with the Universidade de Sao Paulo (USP) in Brazil. The agreement with Chile for ongoing French students has the particularity of four semesters outside France, but the one with Brazil includes only three semesters abroad. The incoming South American students spend four semesters at École Centrale.

Table 9.10. Two Examples of EC Double Degree Agreement with South American partners (CPGE stands for Classe Préparatoire aux Grandes École)

	PUC (Chile)	USP – Option 1 (Brazil)	USP – Option 2 (Brazil)
Mobility Scheme (EC students)	4 Sem at CPGE 4 Sem at EC 1 Sem gap 4 Sem PUC	4 Sem at CPGE 4 Sem at EC 3 Sem PUC	4 Sem at CPGE 4 Sem at EC 3 Sem at USP 3 Sem at EC
Mobility Scheme (Foreign students)	5 Sem at PUC 4 Sem at EC 3 Sem at PUC	5 Sem at USP 4 Sem at EC 3 Sem at USP	5 Sem at USP 4 Sem at EC 3 Sem at USP

Conclusions

The seminars were a great opportunity for integration and they led to a deeper understanding of the status of joint and double degree programmes in each of the participating countries. They highlighted the interest the participants have in innovation, which is shown by the evolution the curricula have had in each university and the plans to develop new curricula. All these actions were checked against the results of the students' survey, so the participants were in an ideal situation to develop new joint and double degree curricula.

The big number of participants evidences the interest there is in this subject, and the commitment to the objectives of the seminars. The professional time invested in these seminars was significant. Good documentation of the outcomes is relevant for the institutions involved and it must be available to use it to develop new actions.

Each seminar had its own particularities, emerging from the interest, or circumstances, of each country. We think that this offers a richness that should be appreciated and considered in future projects, as the new curricula have to be developed based on these present circumstances.

The outcomes show that there is special interest in double degrees at master level. This situation is not surprising, as it shows which degrees are the most developed in these days in the South American countries. Actually, it shows that there is an opportunity to develop joint degrees. The difficulties inherent to the differences between the education laws in European countries and in South American countries will make us select the easy path to implement agreements. Double Degree programmes have been considered an easy and possible path, but they do not invalidate Joint degrees. New creative curricula may be designed considering these differences.

In South American countries, there is interest in developing PhD joint and double degrees, but their development will remain limited in the short term period. However, this circumstance leads to an opportunity for European countries, as this is the right moment to

develop strong agreements, which will have a big impact in the future.
All the data collected in the seminar sessions has helped us to make a clear catalogue of the different schemes utilized by highly integrated international programmes conducted in South America and Europe. Actually, this is valuable material to be used in the design of future curricula. This material, and the now deeper understanding of the needs of South American students, will make possible the design of degrees which are attractive for them.

10.

International Seminars to Achieve a Common Vision: Second Circuit

Marcela Torino
Instituto Tecnológico de Buenos Aires

I. Introduction

During May 2014 representatives from eight South American Universities initiated a trip throughout Europe to visit eight partner institutions in the region as part of a series of seminars regarding double and joint degrees at the Master and PhD level between Europe and South America. This trip was the culmination of a succession of activities: conferences, workshops, meetings, focus groups, surveys, etc. among the ADDE SALEM partners. The purpose of these seminars was to increase the mutual knowledge and understanding of South American and European education, to disseminate the results of the ADDE SALEM project and to explore the possibilities to develop bi-lateral cooperation in graduate engineering education by means of double and joint degrees.

In order to include all ADDE SALEM partners the seminars were divided in two. This chapter will focus on the results obtained by Group 2 whose South American partners: Marcela Torino from Instituto Tecnológico de Buenos Aires- ITBA (Argentina), Ricardo Manfredi Naveiro from Universidade Federale do Rio de Janiero-UFRJ (Brazil), Maria Fernanda Kattan, Pontificia Universidad Católica de Chile-PUCC (Chile) and Guiselle Adriana Garcia Llinas, Universidad del Norte-UNINORTE (Colombia), visited the following institutions: École Centrale de Nantes-ECN (France), École Centrale de Lille-ECL (France), Lund University-LTH (Sweden) and Budapest University of Technology and Economics-BME (Hungary).

The ADDE SALEM seminars were an opportunity to exchange information and provide a platform for interaction between academics and administrative officers from South America and Europe in order to promote deeper collaboration between European and South American institutions through double and joint degrees. While the format for each working group was quite similar, the results obtained and the topics discussed varied at each destination. The following chapter will describe the seminars and the members involved and also give some insight into the results and outcomes achieved during the visits.

II. Methodology

The methodology was established at the last ADDE SALEM Conference in Barranquilla, Colombia by the working committees. Each European institution organized a two day seminar, dedicating one day to cooperation in research and PhD double and joint degrees while the other day was devoted to analysing cooperation at the Master level. The activities planned were established with the objectives set out by the ADDE SALEM group.

1. In order to increase knowledge about the European and South American systems, each host institution and the South American partners presented the educational systems of their home countries and also their institutions, joint and double degree programmes and areas of interest for cooperation.
2. To promote the results of the ADDE SALEM project, these seminars were open not only to the key people at the European institutions who design the curricula and promote double and joint degrees but also to the wider university community. In addition all information was collected to be disseminated after the seminars.
3. Finally in an effort to promote bilateral cooperation in engineering between the institutions involved, every meeting was followed by a "round table" or open discussion where participants were given a chance to work together and interact with their colleagues.

These seminars were attended by university officials, department heads, professors, management, students, alumni, and in one case, representatives from industries.

III. Group 2: Background, Description, Members

Background:
The cooperation between the South American and European institutions involved was quite diverse. In some cases the institutions had well established relationships formed over years and already had double or joint degree programmes in place, while others did

not have any cooperation agreements. Furthermore the level of experience with joint and double degrees in the group was also quite dissimilar. The following chart summarizes the cooperation agreements in place between the participants at the time the seminars were held.

Table 10.1: Agreements between Group 2 at the start of the Seminars

	ITBA	UFRJ	PUCC	UNINORTE	ECN	ECL	LTH	BME
ITBA		Student exchange	Student exchange				Student exchange	
UFRJ	Student exchange				DD-Masters	DD-Masters		
PUCC	Student exchange				DD-Masters	DD-Masters		
UNINORTE								
ECN		DD-Masters	DD-Masters					
ECL		DD-Masters	DD-Masters					
LTH	Student exchange							
BME								

Description:
The institutions participating in Group 2 were quite varied in their characteristics and background. The institutions in some cases were private while others public. Also some of the institutions in this group were quite large and more comprehensive while others were smaller and more specific. In any case all institutions were some of the highest ranked ones in Engineering and had experience with double and joint degrees. The overall characteristics of each institution can be found in the following chart.

Table 10.2: General Characteristics of the institutions in Group 2

	ITBA	UFRJ	PUCC	UNINORTE	ECN	ECL	LTH	BME
Sector	Private	Public	Private	Private	Public	Public	Public	Public
Size[1]	Small	Very Large	Large	Medium	Small	Small	Large	Large
Focus[2]	CO	FC	FC	FC	CO	CO	FC	CO
Research[3]	Moderate	Very High	High	Moderate	Very High	Very High	Very High	High
Age[4]	Mature	Mature	Historic	Established	Historic	Historic	Historic	Historic

1. *Very large: ≥ 30,000 students; Large: ≥ 12,000 students; Medium: ≥ 5,000 students; Small: < 5,000 students*
2. *FC- Fully Comprehensive: All faculty areas + medical school; CO- Comprehensive: All faculty areas; FO- Focused: > 2 faculty areas*
3. *Very High; High; Moderate*
4. *Historic: ≥100 years old; Mature: ≥ 50 years old; Established: > 25 years old; Young: ≥10 years old*

Members:
The following provides a brief description of each ADDE SALEM partner in Group 2 and their experience with double and joint degrees.

South American:
Instituto Tecnológico de Buenos Aires (ITBA) enjoys a reputation for excellence in all aspects of its enterprise. It has given increasing importance to international cooperation, strengthening its involvement in partnerships, networks and associations. ITBA has been working with double degrees with Europe for over eight years. During this time valuable experience has been achieved leading to curricular and operational improvement in already existing programmes. ITBA was also invited to collaborate with the group Evaluate-E, which has begun exploring the impact of double degrees on all its constituencies: institutions, students, enterprises and graduates.

The Universidad Federal do Rio de Janeiro (UFRJ) has been playing a major role in Brazil's social, scientific and technological development. Thanks to its commitment to research and its investment in highly qualified education, UFRJ´s excellence is internationally recognized. UFRJ also developed projects and partnerships with several national enterprises, amongst which some have centers in UFRJ campuses. UFRJ has cooperative relationships with institutions from all continents. UFRJ has experience with ERASMUS MUNDUS projects. Its Escola Politécnica develops a number of projects and research of relevance in its laboratories, often in cooperation with national and foreign companies. It also has partnerships with various institutions around the world, including double degree agreements.

The Pontificia Universidad Catolica de Chile (PUCC) Its College of Engineering mission is to provide excellent education at an international level within the wide field of engineering and to perform research of excellence at an international level, to support the country's scientific, technological and social development. The education quality of its graduates is highly appreciated in the national and international market and they rapidly reach directive positions in leading companies. PUCC, and particularly its College of Engineering, has an important activity in programmes of exchange of students and also in double degrees, both at the undergraduate level and at the graduate level. The College of Engineering has been working, supported by Chilean governmental funds, in a project to improve employability in industry.

Universidad del Norte (UNINORTE) is leader in Colombia for the development of Double Degree agreements. The Engineering College alone has Double Degrees for its six programmes with 4 recognized European and North American institutions. Europe is considered a strategic region by Universidad del Norte and 64 of their 112 international academic agreements are established with European universities. 70 % of their outgoing student mobility is done with European institutions; 48% of their international students on campus come from Europe. UNINORTE is also na-

tionally recognized as a leader in university-industry research projects. It has a long-standing and mutually productive relationship with regional industries. It is the organizer and host of "Cátedra Europa", the scenario to discuss and exchange ideas about how Europe development is going to be reflected in South-American society and the reference centre for Colombian and South-American higher education institutions to present European trends in higher education.

European:
École Centrale de Lille is very active in developing double degrees within and outside Europe. It has a long time experience of working with Brazil, where it also offers students a 2 week trip that includes visits to Brazilian companies. It is also part of a network including Brazilian universities.
École Centrale de Nantes international policies have developed strongly. ECN has developed academic exchanges including Double Degree with 12 universities in South America, particularly in Argentina, Brazil, Chile. Every year, ECN organizes a 2 week student's trip to Brazil and arranges visits to companies and seminars with the managers. ECN is involved in the Franco-Brazilian Doctoral College and in the France and South America exchange programme. ECN was also member of the ERASMUS MUNDUS External cooperation Window lot 16 Eubranex coordinated by Munchen. This programme includes 11 Brazilian HEI partners. Its contact person for the ADDE SALEM project is the representative of the Conférence des Grandes Écoles for South America.
Budapest University of Technology and Economics holds an international reputation for excellence in engineering education. It has a very long tradition of attracting professors and students from all over the world, also by offering courses in English (this has been an unique example in Eastern Europe countries for decades) It has a very close research and education cooperation with national and international industries.
Lund University is the largest institution for research and higher education in Sweden. The Faculty of Engi-

neering at Lund University is called LTH. LTH has extensive experience from joint and double degree partnerships, including ERASMUS MUNDUS Joint Master programmes, several active bi-lateral double degree agreements with HEIs within and outside Europe and an EU-US ATLANTIS project dealing with the benefit of joint and double degree from a stakeholders perspective (EVALUATE-E). LTH has also long-standing bi-lateral student and staff exchange agreements with the South American partners.

IV. Seminars

A. École Centrale de Nantes (Nantes, France)

1. Agenda

Monday, May 12th, 2014: Masters Degrees

- Presentation of ECN / Organization of the studies (courses, exams, international masters…) / Specificities / Educational system (Fouad Bennis, Sabine Vermillard).
- Presentation by the LA partners – structure of HE and DD (Ricardo Naveiro, Fernanda Kattan, Marcela Torino, Guisselle Garcia).
- Relationships with companies (Laure Quedillac – ECN).
- Open discussions. What are the main topics to set up DD agreements?

Tuesday, May 13th, 2014: PhD Degrees

- Organization of PhD studies at École Centrale de Nantes: Doctoral Schools presentation by the LA partners – structure of research, highlight on research specialities.
- B to B cooperation / exchange; double degree at PhD level?
- Visit of the campus/ Labs.

2. Seminar participants

South American Partners (ITBA- Argentina, UFRJ-Brazil, PUCC- Chile and UNINORTE- Colombia), From ECN: Sabine Vermillard (Deputy Director for International Relations), Fouad Bennis (Director for International Relations), Cyrielle Rohart (European & Interna-

tional Projects Manager), Adèle Pruvost (International Projects Officer).

B. École Centrale de Lille (Lille, France)

1. Agenda

Thursday, May 15th, 2014- Focus on Masters

- Welcome by Professor Zoubeir LAFHAJ, Director for International Affairs.
- Presentation ADDE SALEM Programme.
- Presentation of South American Universities.
- Discussion and exchanges about double degree Master System in each country.
- Synthesis.
- Sustainability.
- Visit of Research Laboratories.

Friday, May 16th, 2014- Focus on PhD

- Welcome by Professor Zoubeir LAFHAJ, Director for International Affairs.
- Presentation ADDE SALEM Programme.
- Presentation of South America Universities.
- Discussion and exchanges about double degree PhD System in each country.
- Synthesis.
- Sustainability.
- Visit of Research Laboratories.
- Conclusion.

2. Seminar participants

South American Partners (ITBA- Argentina, UFRJ-Brazil, PUCC- Chile and UNINORTE- Colombia), ECL: Prof. Lafhaj Zoubeir (Dean for International Affairs), Prof. Quayle Nigel (Associate Director for International Affairs), Dr Dziwniel Véronique (Vice Dean for International Affairs), Prof. Sueur Christophe (Lab. Systems, Autonomous Machines and Terrain Networks (SMART)), Ms Bukowski Monique (International Affairs), Ms Clemens Geraldine (Communication Assistant), Ms Stievenard Christine (Communication Technologies), Prof. Pernod Philippe (Dean of Research), Prof. Najjar Denis (Department Science de la Matière-Referent :Mexque Chili), Prof. Araque Marin Marcia Carolina (Department of Chemisty Process-Refer-

ent Colombie Argentine), Prof. Francois Btrno (Lab of Electronics & Electrotechnics de Lille), Prof. Collot Olivier (CNRS), Dr Bachelet Remi (MOOC), Ms Caigny Virginie (Head of Research & Valorisation Research Department)

C. Lund University (Lund, Sweden)

1. Agenda

Monday, May 19th, 2014: Joint and double degrees in engineering on graduate/doctoral level

- Introduction to the ADDE SALEM project, to LTH and the Swedish system of doctoral studies (Per Warfvinge).
- Introduction to the research at LTH Eva Nordberg Karlsson, Anders Gustafsson and Per Tunestål)
- Presentations of South American universities, graduate education systems and activities for internationalization (Guisselle Adriana García Llinás, Marcela Torino, Ricardo Naveiro).
- Summary.
- Open discussion, possible ways to collaborate within graduate/doctoral education.

Tuesday, May 20th, 2014: Joint and double degrees in engineering on bachelor/master level

- Introduction to the ADDE SALEM project and the Swedish system of education (Per Warfvinge).
- Overview of engineering education at LTH (Mario Natello).
- Presentations of South American universities, engineering education, ongoing joint/double degree programmes and internationalization initiatives (Guisselle Adriana García Llinás, Marcela Torino, Ricardo Naveiro).
- Summary.
- Open discussion, possible ways to develop joint/double degrees in Engineering.

2. Participants:

South American Partners (ITBA- Argentina, UFRJ- Brazil and UNINORTE- Colombia), from Lund University: Professor Cintia Uvo (Water Resources Engineering, member of the Faculty Board LTH), Professor Eva

Nordberg Karlsson (Director of postgraduate studies LTH -chemistry, life sciences), Professor Anders Gustafsson (Director of postgraduate studies LTH -physics,ICT, mathematics), Professor Per Tunestål (Director of postgraduate studies LTH -mechanical, civil and architecture, management), Professor Marie Wahlgren (Chair of Education Board LTH), Dr. Féderico Gomez (Food engineering LTH), Dr. Pär Svensson (External relations, Lund University), Miguel Cornejo Herrera (Region Manager Latin America, Lund University), Ms. Christina Grossmann (Head of the international office LTH), Professor Per Warfvinge (Assistant dean LTH), Professor Mario Natiello (Chair of Education Board LTH), Dr. Gerhard Barmen (Chair of Education Board LTH), Professor Carin Andersson (Chair of Education Board LTH), Dr. Kristofer Modig (Programme director chemical engineering and biotechnology, LTH), Dr. Erik Andersson (Research coordinator, Design sciences LTH), Ms. Marie Brink (International office LTH), Ms. Andrea Tarlé Borgström (International office LTH), Ms. Sara Vilotti (International office LTH), Mr. Carl-Johan Andersson (International office LTH)

D. Budapest University of Technology and Economics (Budapest, Hungary)

1. Agenda

Thursday, May 22nd, 2014: Double and Joint Master Degree programmes

- Presentation about ADDE SALEM project with focus on MSc curricula.
- Presentations from South American partners with focus on MSc curricula.
- University visit (buildings, laboratories).
- Short presentation of BME (P Moson), introduction of ADDE SALEM project results (B Nagy).
- Round table on DD curricula, PhD cooperation.
- Open discussion.

Friday, May 23rd, 2014: Double and Joint PhD programmes

- Presentation about ADDE SALEM project with focus on PhD curricula.
- Presentations from South American partners with

focus on PhD curricula.
- Networking – preparation of future cooperation.

2. Seminar participants
South American participants (ITBA- Argentina, UFRJ-Brazil and UNINORTE- Colombia), from BME: Dr. Ákos Jobbágy (Vice-Rector), Dr. Peter Moson (Vice-Rector for international relations), Dr. Gabor Bohacs (Vice-Dean, Faculty of Transportation Engineering), Dr. Balazs Vince Nagy (BME responsible for South American cooperation), Dr. Zoltán Dubéczi (secretary general of the Hungarian Rectors' Conference), Representatives of Companies, Brazilian exchange students (studying in Hungary in the framework of Science without borders and others), BME Double degree (DD) students, BME specialists, professors offering educational programmes, interested in Double and Joint Degree curricula.

IV. Analysis

1. Key points and Outcomes

In the following section we will analyze the four seminars taking into consideration the different approaches and results obtained. As mentioned before the seminars were quite different in scope and the themes discussed varied at each destination, while the general format was the same.

École Centrale de Nantes, France
The first stop in the tour was at École Centrale de Nantes in France where the South American partners met with many representatives from the International Office and Academic Boards. There has been a long history between ECN and some of the South American institutions on the tour; UFRJ and PUCC have long standing double degree partnerships at the master level that date back almost 10 years; therefore there is quite a lot of history and experience with this subject.
The discussion at École Centrale de Nantes centered around the differences between the various educational systems in France, Argentina, Brazil, Chile and Colombia in order to be able to have a framework for

developing double and joint degrees at the Master and Doctoral level. During this time much attention was paid to the legal restrictions at each country and how they are important to understand in order to take into account the limitations of each country at the moment of signing an agreement.
Much of the conversations centered on knowing the credit system at the partner university at the time of establishing a double degree programme at the Master level. In order to be able to evaluate and prepare a double degree programme, comparing student work load is indispensable to achieve a good understanding of the partner institution and its programmes and it is the starting point for any agreement.
In an effort to summarize the differences between the credit systems for Master level students at ECN and Undergraduate Engineering students from the different universities in South America, the following table was established:

Table 10.3: Credit systems at ECN and the South American partner universities

	Semester1 Dates	Semester2 Dates	Years for Eng. Degree	Average credits per year	Total credits in Eng. Degree (approx.)	Class hours/1 credit	Weeks in a Semester	Total Student Work Load (SWL)	Weekly SWL	Class hours per year
ECN	**Sep-January**	**Febr-Jun**	3	60	120+180	25 h	16	7500	47	950
UFRJ	**1 March-15 July**	**1 Agust-15 Decem**	5	48	240	1cr= (1CH+2,5h)*15 =37,5h	15	4200+2100	39	840
UNINORTE	**Feb-May**	**July-November**	5	32	160	1cr= (1CH+2,5h)*16 =48h	16	7680	48	512
ITBA	**1 March-20 July**	**1 August-20 Decem**	5	48	240	1cr= (1CH+0,5h)*17 =25,5h	17	6120/32	38	816
PUCC	**1 March-15 July**	**1 August-15 Decem**	6	90	520	1cr= (1*18) =18h	18	9360	49	624

Another important aspect in developing a Master Double Degree that was mentioned during this seminar was the importance of knowing the grade system at each partner university. The following table shows the differences of the grading systems:

Table 10.4: Grading Systems at ECN and at the South American universities

	Grades are Relative or Absolute	Grading Scale (min-max)	Minimum grade to pass	GPA
ECN	Absolute	0-20	10	GPA+ECTS
UFRJ	Absolute	0-10	5	No
UNINORTE	Absolute	1,5-5	3	Yes
ITBA	Absolute	`1-10	4* (corresponds to 60% of the material)	No
PUCC	Absolute	`1-7	4	Yes

Most of the time of this seminar was spent analyzing the differences and opportunities that the South American universities offer in order to improve the implementation of double and joint degree programmes at the Master level.

École Centrale de Lille, France

The first day at the École Centrale de Lille seminar was dedicated to cooperation on the Master level where all the participants had more experience and could present the programmes already in place in order to give different models for the types of agreements that can be achieved between the universities from both regions.

On day 2, there were many more participants from the university during the PhD double and joint degree discussions than during the Master level debate. This may be due to the fact that there is less knowledge and more work to be done regarding double and joint degrees at the PhD level between Europe and South America. The South American partners had the opportunity to meet the Director of PhD Research for the Lille region who was quite interested in the proposals and in finding ways of collaborating with South American institutions. There was also time to visit laboratories and see the way research is developed, financed and maintained in France which can differ from the way research is conducted in South American universities; giving a perspective on not only the areas of interest but also on the mechanisms in place for research teams. Both ECN and ECL are highly intensive research based universities which provides universities such as ITBA and UNINORTE that have growing research programmes, a point of reference and help in understanding the capabilities of each institution.

Lund University, Sweden

The seminar held at Lund University was one of the most highly attended stops of the tour. During the two days there were a great many people from both academic and administrative staff from the University. Unfortunately during this visit there were only three representatives from South America (Argentina, Brazil and Colombia) since the representative from Chile had to abandon the group due to previous commitments.

On day 1 the group worked together analyzing the opportunities for cooperation on the PhD level. All participants presented their programmes and their potential areas of interest. One of the most outstanding

comments during these meetings was the importance of making connections between faculties in order to facilitate the cooperation between institutions and work towards joint and double degrees. The emphasis was placed on finding funding for both Swedish and South American professors and researchers to visit their colleagues and work towards developing different types of agreements.
In 2010 a law was passed in Sweden which gave permission for the creation of Joint Degrees at a PhD level. This differs from the South American counterparts where in some cases there is a lack of legislation on joint degrees (for example in Argentina). While on both sides there were many cases of co-tutelle agreements at the PhD level, there were few, if any, cases of joint degrees in Engineering. Nevertheless there is interest on both sides to explore new potential taking into account some practical issues: such as financing for PhD students, length of stay at partner institution, legal requirements, etc. All parties agreed that joint degrees require more preparation, more formal consideration and more elaborate agreements between partners.
Regarding the possibility of developing joint and double degrees at the Masters level, there was common understanding that double degrees can easily be arranged. The discussion during day 2 centered on knowing the partner institutions well, in order to work towards a double degree. During the sessions a particular case was analyzed between the institutions involved: after more than five years of exchanging students Lund and ITBA are preparing to sign a double degree agreement in Chemical Engineering.

Budapest University of Technology and Economics
The seminar held in Budapest focused mainly on different areas of cooperation between members. Other than students from Brazil studying in Hungry through the Programme "Science without borders" there is very little cooperation between South American and Hungarian universities. Therefore the lack of information on each side was a motivating factor in learning more about each system and the different scenarios

for collaboration. Also the dissemination of the results of the ADDE SALEM project was especially important during these two days. In this regard the audience was not only composed of administrators and professors but also students and representatives from companies learning to know more about the prospects of double and joint degrees and about the South American universities involved in the project.

One aspect that was mentioned which was of great interest to the partipants the importance of involving the Hungarian communities present in South America in this initiative. In both Argentina and Brazil there are large Hungarian communities which are quite active in the society and who have strong links to their home country. The possibility of involving these communities would make it possible to capitalize on the relationships and ties that these communities have developed over the years.

It is also important to mention that the Hungarian government provides scholarships for students from South America wishing to study in Hungary. Among the main restrictions in countries such as Argentina and Colombia, where the government does not provide funding for students who wish to go abroad, are the financial complications in preparing studies for a year to two year period in Europe. The funds provided by the Hungarian government may be a way to motivate and help South American students wishing to pursue a joint or double degree.

Finally another topic of dialogue was the importance of creating the financial conditions for future cooperation between the institutions through Erasmus + projects, government funding, support from industry and institutional grants that provide the base for these types of agreements. Only through finding viable economic models will the efforts made by the universities evolve into long lasting agreements.

2. Conclusions

The ADDE SALEM seminars were the final activity after a three year project between the partners. They were an educational tool for both European and South American partners, where the partners from the south learned from the rich history of the European institutions in double and joint degrees; and where the European administrators and academics had an opportunity to learn about South America and the educational opportunities of the region. These seminars were also the basis for developing new partnerships between the partners as was the case between ITBA and Lund University who are preparing to sign a double degree at the Master level for Chemical Engineering. Finally, the seminars made it feasible for different levels of the university population to get to know more regarding the possibilities of double and joint degrees and the results of the project, in an effort to make these initiatives more attractive not only to students and professors but the whole academic community. In this sense the initial objectives laid out by the ADDE SALEM partners were met at each destination. Nevertheless the outcomes and conversations between the participants resulted to be the most attractive portion of the seminars for the people involved. By providing information and resources on each side every participant was given a chance to show case their country and institution and give way to discover new and innovative opportunities for collaboration in double and joint degrees.

While the seminars had similar structures and objectives, the subjects discussed, the participants and the focus of each seminar were quite different taking into account the particular circumstances of each institution involved. These differences are not considered as obstacles but are rather seen as added value to the project since they are points to take into account when developing double and joint degree curricula. Although the themes varied at each destination, there were recurring subjects that came up in every seminar such as: the importance of securing financing for these projects in order to make the cooperation viable,

the differences in legislation at each country regarding double and joint degrees, the significance of involving the academic leaders in these initiatives, and the great interest on both sides in developing both double and joint degrees.

As was seen in the material exposed, there is more experience in developing double degrees at the Master level between Europe and South America and these seem to be the stepping stones for what can be considered more elaborate degrees such as joint degrees. The problems with inadequate or no legislation regarding joint degrees in some countries such as Argentina make signing joint degree agreements difficult although not impossible. As is the case, most times legislation will catch up with the academic trends and make these types of agreements between northern and southern institutions more viable in the future. Therefore the experience that European institutions have in developing joint degrees is valuable for the South American institutions who wish to build up new curricula. On the other hand, the potential of the South American market for the European counterparts is great.

In reference to PhD double and joint degrees the prevailing concept is that the faculty contact is essential. While both sides are interested in fostering these agreements, it is only through researchers on both sides looking to cooperate that these efforts can be successful. In this regard, the South American partners have more ground to cover since these agreements are relatively new in the academic community.

11.

The Quality Control Committee

Javier A. Paez Saavedra
Fundación Universidad del Norte, Colombia

The Quality Control Committee was a very important part of the structure of the project; this committee was in charge of monitoring the quality of the process by having access to all documents exchanged in each Committee and among them. Members from South American Institutions and European ones constituted it, each one from different institutions.

The activities of the Committee were focused on assuring the quality at each step of the process. There are two important stages to consider in terms of quality assurance, the starting and the execution phases. The starting process is critical for the success of the project. In our case, the coordinator presented to all partners the outlines and the details of the project with the planned outcomes, opening a discussion. General timelines were already part of the project. The Committee recommended to adopt timelines for each Committee and working group.

For the execution of a project, the management of the flow of information is also critical. For the ADDE SALEM project, the committee decided to recommend two things. The first one was to have all the information in a file in Dropbox. It means that all the Committee and working groups had to upload all documents and information so that all partners could have access to all information. This mechanism was a good choice both for its cost and accessibility.

The second decision of the Committee was to prepare a template for the minutes of the meetings of every Committee and working group. This template was presented by the Quality Committee and approved by the Management Committee. It has four parts. The first one defines the purposes of the meeting and its agenda. This demands a careful planning of the meetings and made them more effective and efficient. The second part lists the participants with the institutions they were representing.
In the third part a summary of the issues treated during the meeting is contained and the relevant conclusions. The fourth part of the template lists the issues that have to be followed up. In a column the activities are defined. In the second column the people in charge of performing the tasks are defined. The third column reports the deadlines decided for each activity. Figure 11.1 shows the template.
The Quality Control Committee's contributions were important in order to meet the objectives of the project in an effective and efficient way. . The experience gained in this project for quality issues can be useful in the implementation of other projects.

Fig 11.1 Template

COMMITTEE:
Report Meeting N.

Date:	Start time:	End time:

Purpose of the meeting:
Agenda:
- A
- B
- C

...

Participants (name, institution, charge):
- a
- b
- c
- d

...

Notes:

Matters to follow up

Activities (task to perform in the future):	Responsible (person in charge to perform the tasks):	Deadlines
1. 2. 3.	1. 2. 3.	1. 2. 3.

This Report has been elaborated by (name, institution, role in the ADDE SALEM project, signature):